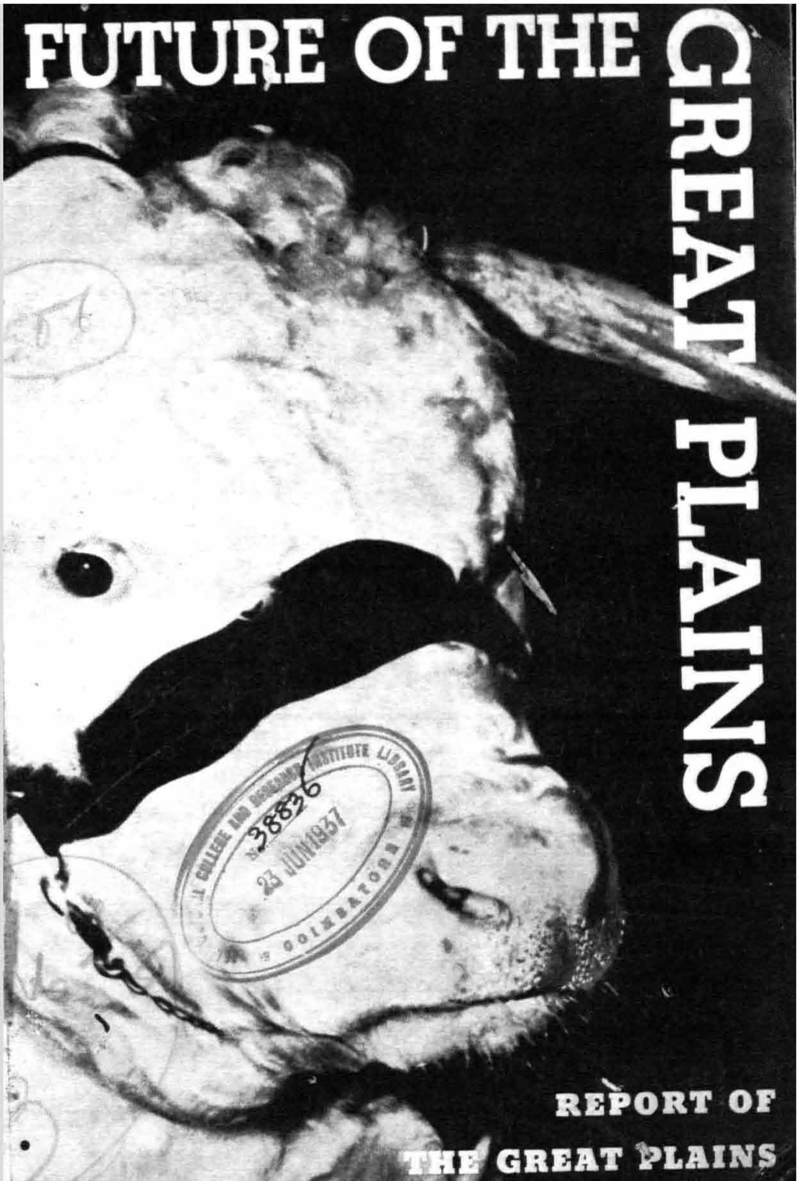
FUTURE OF THE GREAT PLAINS



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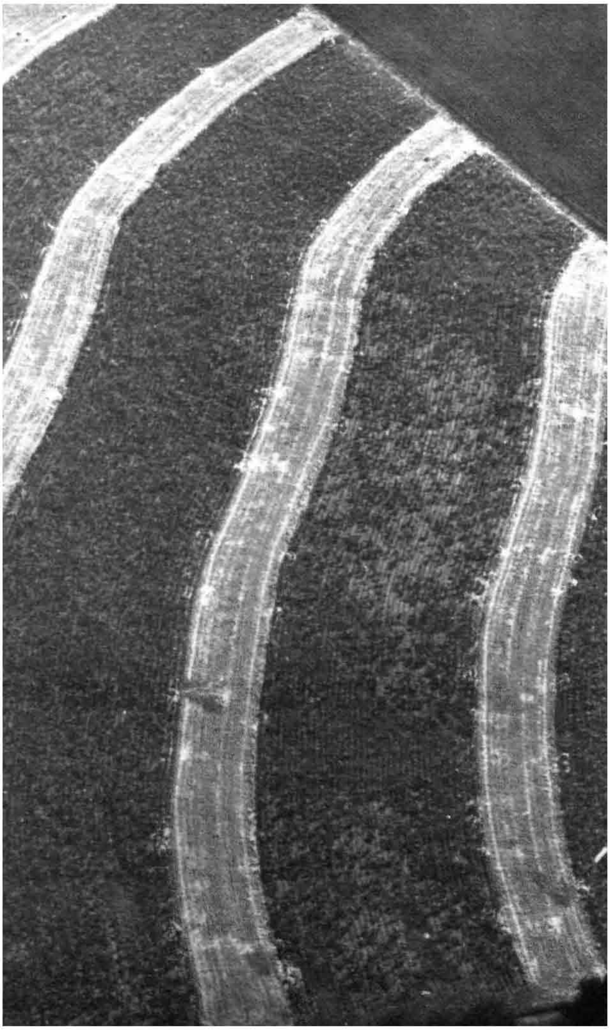

THE FUTURE OF THE Great Plains

REPORT OF THE GREAT PLAINS COMMITTEE

38836

DECEMBER 1936, WASHINGTON, D. C.

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SUMMARY

FOREWORD

*

The Purpose of the Report

In 1934 and again in 1936 drought conditions in the Great Plains area of the United States became so severe that it was necessary for the Federal Government to take emergency steps to rescue dying cattle, relieve destitute families, and safeguard human life. The experience of the two tragic years made it evident that the drought had merely accentuated a situation which had been long developing. The agricultural economy of the Great Plains had a perilously narrow reserve. Its prosperity depended on favorable weather and markets, neither of which could be expected to be continuously present.

Droughts could not be prevented. They were admittedly part of a weather cycle which runs its course beyond the range of human interference. Agriculture must adapt itself to the cycle and make the most of what Nature has to offer. This it had largely failed to do. It became clear that unless there was a permanent change in the agricultural pattern of the Plains, relief always would have to be extended whenever the available rainfall was deficient. Current methods of cultivation were so injuring the land that large areas were decreasingly productive even in good years, while in bad years they tended more and more to lapse into desert. The water supply, which literally meant life or death to human activities in the Region, was being in part permitted to run to waste, in part put to uses which did not extract all its values.

The steady progress which we have come to look for in American communities was beginning to reverse itself. Instead of becoming more productive, the Great Plains were becoming less so. Instead of giving their population a better standard of living, they were tending to give them a poorer one. The people were energetic and courageous, and they loved their land. Yet they were increasingly less secure on it.

No one aware of the facts could be content with emergency measures which would relieve pressing immediate needs but would not arrest the downward trend. Representatives of the Federal Government, going into the field to study the problem and confer as to ways of dealing with it, found the people of the Plains ready to welcome every constructive suggestion. They were in no mood to abandon their land. They were willing to do all that was humanly possible to save it. But they needed leadership and, like other victims of natural disaster, they needed outside help.

The Federal Government had taken upon itself the responsibility for direct relief in time of dire need. It was the only existing agency which could at once consider the requirements of a group of States and of fractions of States which were faced with a common and urgent problem. It was the only agency which could mobilize the resources of the whole country, so far as they were required, to prevent suffering in the stricken area.

It had, moreover, a direct interest as owner of public lands and national forests within the Region; it was well equipped to continue and to

initiate researches on which effective action could be based; it had the power to make loans and grants where these could be shown to be for the general welfare; and it was in a position to coordinate State and local agencies if a program could be worked out on which all would agree.

These factors led to the creation of the Great Plains Drought Area Committee, which rendered a preliminary report last August; and to the appointment by the President of the Great Plains Committee, whose further studies are summarized and recommendations submitted in the present report.

The Nature of the Problem

The present situation in the Great Plains area is the result of human modification of natural conditions. Prior to the coming of the white man, and to a large extent prior to about 1866, man did not greatly alter conditions on the Plains. The Indians did two things: they killed buffalo and they sometimes set fire to the grass. They do not seem to have reduced the number of the buffalo seriously, and though their fires may have influenced the nature of the vegetation they did not destroy the primitive grass cover. If drought killed off the buffalo they multiplied again in wet years. There is no evidence that in historic times there was ever a severe enough drought to destroy the grass roots and cause wind erosion comparable with that which took place in 1934 and 1936; that phenomenon is chargeable to the plowing and overcropping of comparatively recent years. The great loess deposits of the Missouri Valley, sometimes pointed to as proof of prehistoric dust storms, are more probably water-laid, with some supplemental dust blown from dried glacial lakes or outwash plains.

Nature has established a balance in the Great Plains by what in human terms would be called the method of trial and error. The white man has disturbed this balance; he must restore it or devise a new one of his own.

Before going further it will be well to explain, as precisely as possible, what is meant by the Great Plains. Precision is more attainable in defining the western boundary, which is conveniently marked by the eastern slope of the Rocky Mountains. The eastern boundary may be indicated in one of several ways, but it is always vague. Indeed, it may be thought of as moving east or west in accordance with climatic cycles, and even with the economic and technological conditions of human occupancy.

The classical line is that of the one hundredth meridian; although we may also take the western boundary of the normally humid soils, the boundary where the tall prairie grass gives way to the short or middling plains grass, or the frontier west of which the normal rainfall is 20 inches or less. For practical purposes the present Committee has drawn a line (Figures 1 and 2) west of which generally major readjustments in land and water use appear necessary to meet climatic conditions. These theoretical boundaries are not far apart from one another. All approach the Mississippi rather closely in the north and swing in a southwesterly direction as they run south. The traveller will be readily aware of them in an automobile or railway journey across Kansas or Nebraska.

The whole area thus marked off has certain common characteristics: relatively light rainfall, high summer temperature, high winds, and fine-grained soils which blow and drift when not held together by vegetative cover. There is little natural growth of trees, except in river bottoms, on the eastern slopes of the Rockies, and on occasional outcroppings such as the Black Hills. Fluctuations in rainfall may be no greater than in most other parts of the United States—perhaps not even so great, measured in inches—but they are all-important because the rainfall hovers around and at times falls below the critical point at which it is possible to grow crops without irrigation.

The soils are among the richest on the continent. With water they are highly productive.

Hence the climatic variations from year to year, and from the wet to the dry stage of a cycle, are closely reflected in the Region's productivity. Within the larger climatic cycles there appear to be series of shorter ones, none of them measured with any degree of accuracy as yet. Similarly there are large-scale geographical variations within the Region and a confusing number of local fluctuations in rainfall.

In the North the winters are severe: there, an early frost may freeze the ground so that subsequent rains run off without soaking in, or, on the other hand, a plentiful fall of snow may protect and moisten the soil. In the South snow lies for long periods only at the higher elevations, and because the soil is exposed for a longer period it is more subject to wind erosion. But the pattern of the Region is more intricate than any broad generalization is adequate even to suggest—indeed, it has yet to be thoroughly surveyed. A single farm may contain many kinds of soil, each reacting in a different way; or, if the soil happens to be fairly uniform, the difference of a few degrees in slope may determine whether it is tillable or not. Drought may affect the whole area, or only a part of it. It may strike the South one year and the North the following year.

All these facts point to the urgent necessity of more detailed knowledge of the land than we now possess and a more thorough inventory of the water resources which make it valuable.

There is no proof that a permanent change in climate, in the direction of greater aridity, is taking place. There is some reason to believe, however, that the Plains underwent a dry cycle between 1825 and 1865; that this was followed by a cycle during which rainfall was above the former average; and that we may now be past the trough of another dry cycle. It must be noted that dry years may occur during a wet cycle and wet years during a dry cycle. Thus the period from 1886 to 1895 was one of disastrous droughts in the Great Plains, even though the forty years from 1865 to 1905 might show an average rainfall, in most parts of the Plains, above the critical point of 20 inches. The meterologist cannot always be sure whether he is dealing with a major cycle or with a lesser cycle, and consequently he is cautious in making predictions.

The Settlement of The Plains

The great movements of settlers into the Plains and the great expansions of the cultivated and heavily grazed areas have come during wet periods. This is partly the result of chance, since the major wet period which followed the close of the Civil War happened to coincide with a period in our history when there was an eager westward movement of population. It is also evident that the westward tide of settlement was accelerated by a succession of wet years and good harvests. With an optimism which it is hard to condemn, yet which frequently led to disastrous results, farmers and ranchers mistook a rainfall which happened for a period to continue above the critical 20-inch margin, for the permanent climate.

This illusion was shared by speculators, by the land-grant railroads which had large tracts to dispose of and which wished to build up their freight traffic, by States with land-grant scrip to sell, and by the Federal Government itself, through its homesteading policy and its sales of public land. Newcomers were invited to homestead 160-acre tracts, although we now know that in most parts of the Great Plains a farm of this size is far too small to support a family. They were required to put this land under the plow, regardless of whether or not it was suited for cultivation. Not until 1909 was the homestead tract belatedly enlarged to 320 acres; and although in 1916 grants of 640 acres were authorized, the provision was made that they be devoted solely to grazing and stock-raising. Thus the homesteader often had to plow when plowing was harmful to the land, and he was sometimes forbidden to plow when plowing might have been profitable and beneficial.

Settlement followed the lines of the transcontinental railroads, as in earlier times it had followed navigable rivers. It was facilitated by *the introduction of barbed wire, which made it possible to fence ranches at comparatively small cost. Changes in the Plains economy came swiftly. From the end of the Civil War until about 1886 great herds were grazed on what* was practically a single open pasture, thousands of square miles in extent. From Texas into Montana these herds ranged. With the drought years which began in 1886, and with the continued enclosure of the land by homesteaders and purchasers, the range became insufficient and the "cattle barons", who had controlled herds which in number had rivalled the buffalo of ancient days, began to fade from the picture.

There was only a slight increase in the number of range cattle on the Great Plains after 1890. In the range portion of eight Plains States the number reached 12,082,000 by 1920, but declined to 10,195,000 by 1935. Yet, because there had been a continued and serious deterioration of the range, because a considerable area had been converted from range to tillage, and because severe drought conditions had burned the land during 1934, the Great Plains are estimated to have been nearly 100 percent overstocked in 1935.

While grazing reached what was at least a temporary peak the area of cultivation extended westward, expanding during and after wet years, contracting somewhat as farms were abandoned in dry years, but on the whole growing at the expense of the range.

After 1910 powerful new influences were felt. The tractor, the combine and other power machinery enabled an individual to plant and harvest a much larger acreage than before. At the same time the cost of buying and maintaining this expensive equipment obliged him to secure a cash crop. The World War and the following inflation pushed the price of wheat to new high levels and caused a remarkable extension of the area planted to this crop. When the price collapsed during the post-war period Great Plains farmers continued to plant large wheat acreages in a desperate endeavor to get money with which to pay debt charges, taxes, and other unavoidable expenses. They had no choice in the matter. *Without money they could not remain solvent or continue to farm. Yet to get money they were* obliged to extend farming practices which were collectively ruinous.

Wheat was the outstanding cash crop. As late as 1934 about 17,600,000 out of 44,800,000 harvested acres in the Great Plains were under wheat; in western Kansas in the same year over 6,000,000 out of 8,000,000 were given over to wheat. Soil not previously plowed was exposed to the wind, with no cover crop to protect it between seasons. The effects of wind erosion were more disastrous in the South than in the North, but the exposed and friable soils almost everywhere were washed or blown to some extent. Just as overgrazing had impaired the natural pasture, so a wrong method of cultivation, forced upon the farmers by influences they could not then control, injured what had been considered tillable land. If this plowing of new land had been necessary in order to meet an urgent human need for breadstuffs, the injury to the land would at least have been the better of two evils. But the result was actually to produce an unsalable surplus. Crops were sometimes abandoned because the market price did not equal the cost of shipping. In many cases "suit-case farmers" put in crops on otherwise unimproved land, broke camp at the end of the plowing and planting season, because of ensuing low prices did not return to harvest what they had sown, and left the soil partially exposed to the drying and eroding winds.

Even more closely than in most other parts of the United States the problem of the land was linked with that of the water. Dry farming was a speculation in which Nature was the unpredictable agent—if enough rain fell there was a harvest, if drought supervened there was not.

At the same time many water resources of the Region were wasted or not put to the best use. Under the accepted doctrine of prior appropriation water has often been diverted to poor land at the expense of good land; irrigation systems frequently have been poorly designed and improperly financed; and in some parts of the Plains the underground waters, which are exceedingly slow in replenishing themselves, have been depleted. And generally the rains have been permitted to run off the fields because of lack of practices which would have compelled them to soak in.

The Present Situation

As a productive resource, as a place to work and as a place to live, the Great Plains therefore present a disquieting picture. If there were no hope of restoration, with benefit both to the population of the area and to the Nation, the present report would be only a brief final chapter in a record of failure and disaster. No such conclusions need be arrived at, yet certain facts must be faced. There are perhaps 24,000 crop farms, c vering a total of 15,000,000 acres, which should no longer be plowed. Of the range lands probably 95 percent have declined in forage value, this decline varying from 25 to 50 percent of its original value in southwestern North Dakota to from 50 to 75 percent in southwestern Nebraska and northwestern Kansas.

These physical changes unavoidably have been accompanied by social and economic changes. There has been a marked decline in the quality of living which could be achieved by a stalwart and energetic population, which in stock and physique is not excelled in the western world. Farmers have met the problem of holdings too small to support a family by renting additional acreage and there has grown up a confusing, intricate, and inefficient pattern of ownerships and tenures. Tenancy has increased steadily. In eight Great Plains States (not including Oklahoma and Texas, where cotton growing outside the Plains area makes tenancy data non-typical), in 1935 more than 41 percent of all farmers were tenants. In the whole area 35 percent of all the land in use was leased or rented in 1900; by 1935 the percentage had risen to 51. The burden of mortgages, debts, and taxes undoubtedly had rendered a much larger proportion of farmers owners only in name.

The tenant system on the Great Plains is in some respects a result rather than a cause. The situation would not be cured overnight even though it were possible to deed every acre of land in use to those who now work it. Nevertheless, tenancy has been a link in a chain of events which have led to instability of population within the Region, to neglect of improvements, to low living standards, to insistence—sometimes included in the rental contract—upon a cash crop, to depletion of the soil, to destruction of the grass cover by overgrazing, and to a decline in the tangible and intangible values of community life. The nominally independent owner, harassed by his own burdens and carrying on an enterprise which is at present highly speculative, has not been able to arrest these tendencies. Depression and drought have accentuated trends long in the making. Tax delinquencies have brought about a vicious circle of higher tax rates on a diminishing tax base. The credit of the taxing units has declined as their debts have increased, and schools and other public services have suffered.

The Region as a whole has not maintained its economic position; the return for energy expended has been less than for similar expenditures of energy upon the land in most other sections of the country. Despite its energy and self-reliance the population of the Great Plains has found itself in a position in which it was compelled to ask or accept outside assistance out of proportion to its numbers.

This is a matter of direct concern to the Federal Government and to the country as a whole. Between April 1933 and June 1936 the accumulated amounts of Federal aid expended in the area ran as high in some counties as $200 per capita. Net increments to the relief population of the whole

United States between 1933–34 and 1934–35 amounted to 4 percent; in New Mexico they were 19.2 percent, in South Dakota 17.6 percent, in Oklahoma 11.3 percent, in North Dakota 10.9 percent. In June 1935, 20 percent of all the farmers in the spring-wheat area of the Plains were receiving relief and another 8 percent were in process of rehabilitation.

The Nation can afford such relief when it is needed. It cannot afford *not* to give it when it is needed. But the integrity of community life on the Plains, the solvency of the Plains economy, and the welfare of the Nation, which suffers indirectly as the population of the Plains suffers directly, demand that here, as elsewhere, a secure and stable substitute for relief be found. The Committee has been impressed during its field trips by the certainty that in the Great Plains area it was dealing with people who desired nothing else than to earn their own living by their own efforts. It is a cruel error to regard any large portion of this population, as some uninformed commentators have done, as speculative investors whose calculations have gone wrong. Not in money alone, but also in labor and endurance, they have paid for better fortune than has yet been theirs.

The Great Plains farmer in many cases will need relief for some time to come. He will need credit for a longer period. Primarily he needs not only help in reorganizing his work, so that his courage and his efforts will not be in vain, but also a new point of view. No individual, no community, no county, no single State, can do alone all that needs to be done; and no one can safely settle any individual or local problem without some consideration of the general problems of the whole area.

The people of the Plains are finding their way toward an attitude of mind, deep-seated and not often brought out into the open, which will affect both their thinking and their doing. Many of the assumptions which the pioneers had found workable in other regions, under other conditions, have proved unworkable on the Plains. The Plainsman cannot assume that whatever is for his immediate good is also good for everybody—only of his long-run good is this true, and in the short run there must often be sacrifices; he cannot assume the right always to do with his own property as he likes—he may ruin another man's property if he does; he cannot assume that the individual action he can take on his own land will be sufficient, even for the conservation and best use of that land. He must realize that he cannot "conquer Nature"—he must live with her on her own terms, making use of and conserving resources which can no longer be considered inexhaustible.

In this new point of view, and in this task of realizing the true and lasting values of the Great Plains, the whole Nation has more than a sentimental stake. The Great Plains can be made a dependable source of a large portion of our essential food supply. Investments in their development can be rescued from uncertainty, and under proper conditions new investments can be made securely. The Plains can be transformed from a risky adventure and a recurrent liability into a stable basis of economic and social profit to their inhabitants and to the whole country.

Steps Toward Solution

The problem of the Great Plains offers no simple solution. Yet enough is known about conditions and their causes generally throughout the Region, and in detail with respect to certain parts, to permit immediate and vigorous execution of a program of readjustment and development. Further studies of details should proceed simultaneously with the execution of the program, but the beginning of action should not be permitted to await these studies, which should in fact be a part of the program.

As the basis of a program there should be a clear analysis of the complementary parts which should be played by the various agencies which have a stake in the future of the Plains. Following is an outline of the analysis and recommendations presented in Chapter VI of this report.

I. LINES OF FEDERAL ACTION

1. *Investigations and Surveys.*—It is recommended that provision be made promptly for the requisite investigations and surveys to determine, insofar as it has not been done, the best uses of land, waters, and other natural resources throughout the Great Plains. These should include: the completion of topographic, hydrographic, and soil surveys; studies of climatic risks; a study of the possibilities of new irrigation projects in advantageous locations; a study of the proper size of ownership and operating units under varying conditions and in varying locations; studies in the cause and cure of erosion; and inquiries into occupational opportunities for those who can no longer make an adequate living on the land. A 10-year program should be mapped out for these additional investigations by the Federal Government. They are essential if the long-run development of each part of the Region is to be guided intelligently.

2. *Federal Acquisition of Land in Range Areas.*—It is recommended that the Federal Government continue the policy of purchasing scattered crop farms and other appropriate lands in areas devoted largely to grazing and most suitable for that purpose. Such purchases should be made with due caution and only after sufficient data have been accumulated to make good results probable in each case. The lands which should be acquired lie mainly in the western and more arid parts of the Region. Factors to be taken into consideration should be not only the nature of the land and its water supply but also local sentiment, the predicament of owners whose resources do not permit them to make a satisfactory living on the land they now occupy, and the possibility of rounding out the range land at the disposal of existing grazing districts or associations.

3. *Control and Use of Lands Acquired by the Federal Government in Range Areas.*—In conjunction with the policy of land acquisition it is recommended that the control of purchased lands situated within the limits of Federal grazing districts be retained by a Federal agency free to distribute range rights in accordance with the objectives of general rehabilitation as well as of existing priorities. Land acquired in areas where there is no public domain, or not enough to justify the organization of grazing districts under the Taylor Grazing Act, should be leased to cooperative grazing associations. In the administration of purchased lands it is essential that the Federal agency cooperate with all other agencies in the formulation of rules and regulations in order to obtain best range use.

4. *Measures to Increase the Size of Farms.*—It is recommended that assistance in the enlargement of undersized operating units be provided: (1) through extension of credit under suitable restrictions, and (2) experimentally through Federal purchase of selected land and its subsequent lease or sale under covenants protecting its use. A minimum size of family unit for each type of land should be determined and demonstration farms should be established. This plan demands, of course, the approval and cooperation of the owner from whom the land is to be bought or leased and of the operator who is to manage it.

5. *Development of Water Resources.*—The water supply of the Great Plains cannot be increased by any practicable means within human control. The best that can be done is to regulate the varying supply at our disposal, and to adjust the land and water economy to that supply. The Soil Conservation Service has demonstrated that generally water can be stored by suitable farm practices in the soil itself in sufficient quantities to increase growth of grass and farm crops and to resist drought. Every effort should be made to acquaint farmers with the water-conserving measures which have been found effective. The Water Resources Committee of the National Resources Committee has pointed out that something can be done to improve the supply of water for the purposes of watering stock, but that it is not to be expected that more than 3 percent of the total area of the

Great Plains can ever be irrigated. It is recommended that attention be given to the development, where natural conditions favor, of small-sized irrigation systems to water up to 1,000 acres each, to be operated in connection with storage reservoirs on tributaries or pumping plants on the major streams.

6. *Resettlement.*—Excessive droughts in the Great Plains have resulted in the aimless and desperate migration of thousands of families in search of some means of livelihood. Many have moved to the Pacific Coast, others have settled on cheap cut-over lands, but few have improved their economic status. Many more would have been forced to leave but for public aid and relief. Until the effects of severe droughts have been sufficiently minimized by results of the long-time program, by crop insurance, or by other means, emergency measures involving some resettlement probably will be necessary.

The adoption of the recommendations of the Committee would necessarily result in a certain measure of resettlement. However, pending the completion of detailed plans for readjustments of land use, it is impossible to determine whether a further sizeable migration from the Region can be avoided. Suitable opportunities should be found, if possible, within the Region, but each case should receive individual consideration for its best solution.

7. *Compensation to Local Governments on Account of Federal Land Acquisition.*—Purchase of lands by the Federal Government may result in shrinkage of the local tax basis. With careful consideration of each situation, provision should be made to compensate local governing bodies for the loss of tax revenues when such purchases are made. Payments made directly by the Government to the counties affected might often prove inequitable, and it is suggested that payments should preferably be made directly to the States, with amounts earmarked for the counties in which acquisitions take place, but leaving to the discretion of a State administrative agency the ultimate distribution among the local units.

8. *Control of Destructive Insect Pests.*—The control and possible eradication of insect pests which ravage periodically sections of the Great Plains should be a part of the long-range rehabilitation program. Rather than considering such destructive outbreaks as inevitable, preventive efforts through intensive research and extensive complementary experiments should be initiated on a wide front.

9. *Development of Other Resources.*—The development of other resources, such as the vast lignite deposits which underlie the northern part of the Great Plains area, may be feasible. This would provide alternative occupation for some people. It is suggested that investigations already made by the Bureau of Mines be pursued further and that demonstration projects be established by a suitable agency to prove or disprove the economic feasibility of the use of lignite in the generation of power. Other mineral resources, where not yet fully exploited should receive similar consideration.

II. LINES OF STATE ACTION

Any action taken by the Federal Government should be conditioned by the extent to which the necessary complementary action is undertaken by the States. The following suggestions are made in accordance with this conviction:

1. *Legislation.*—Each of the States having territory in the Great Plains area is urged to undertake a survey, as promptly as possible, with a view to necessary revision and extension of its present laws affecting land and water use and conservation. This would include laws relating to tenancy, leasing, taxing, and tax delinquency. These should be so simplified and interrelated as to avoid existing evils of lack of laws, inadequate laws, ineffective provisions for administration, and conflicts of jurisdiction.

2. *Zoning.*—The principle of zoning is logically as applicable to rural territory as it is to cities and towns. It is believed that the legislatures of the several States in the Great Plains

area should pass enabling laws under which their respective counties may zone land in terms of its proper use. Such legislation is deemed necessary to prevent permanent impairment of the land by unwise extension of the cultivated area during periods of supernormal rainfall or of exceptionally high prices; to give stability to land-use patterns which may be determined upon, such as a combination of stock-raising and arable farming in areas which should not be given exclusively to the quick "cash crop"; to simplify and consolidate the pattern of settlement and so reduce or keep down expenses for schools, roads, and other community services; to reduce the amount of speculation in land; and generally to give permanence and greater stability to any land-improvement and land-conservation policy.

3. *Grazing Associations.*—One method of improving the conditions resulting from too-small holdings and the checkerboard ownership pattern in the Great Plains is the establishment of cooperative grazing associations. The grazing association makes possible the operation of large tracts as units and in effective conjunction with adjacent dry-farming and irrigated land. It reduces destructive competition among stockmen for the use of the range and tends to eliminate overgrazing, inflation of land values, and other evils. Such associations are sanctioned under the Montana law, under the supervision of the Montana Grazing Commission, and it is suggested that this system be adapted for use in the other Great Plains States.

4. *Control of Erosion on Arable Lands.*—Conservation in the Great Plains area would be greatly stimulated if each State were to adopt appropriate legislation permitting the qualified, property-tax-paying voters of a county or other division to form a soil conservation district. The Land Policy Committee, the Soil Conservation Service, and the Office of the Solicitor in the Department of Agriculture have joined in drawing up a suggestive standard law for the formation of such districts, and it is urged that the legislatures of the Great Plains States give early attention to the proposal.

5. *Tax-Delinquent Range Lands.*—It is desirable that the States should avoid the resale of such lands to private individuals, and should make them available for coordinated use with other public lands through cooperative grazing districts or other means.

6. *Community Organization.*—The Great Plains States might well encourage local communities to make broader use of legislation permitting the consolidation of local governments and other changes in organization which would make for economy. In this way costs of roads, schools, and other public services might be reduced without loss of efficiency.

7. *Taxation.*—Taxing systems in the Great Plains States probably must continue to have their basis in the land. It is suggested, however, that prevalent modes of assessment and collection may have ceased to be suitable for the economic and social conditions that have developed; and that some revision of the taxing system which will take account of the current or average income from the land would prove to be more equitable and beneficial in the long run.

8. *Water Resources and Water Problems.*—These are basic for every agency operating in the Great Plains. The States might well aid farmers in developing local water supplies for stock, etc., through tax reductions, as in Kansas; by simplifying procedures for adjudicating rights to water used; and by giving greater support to State agencies equipped to furnish engineering and other technical advice to farmers and stockmen. The example of the Montana State Water Conservation Board in facilitating small or medium-sized irrigation projects deserves imitation. In many cases highway construction can be utilized safely to assist the conservation of water. Existing State laws do not as a rule limit the amount of ground water to be pumped by any one appropriator or ensure that such water is not wasted; these defects should be remedied.

9. *Land Occupancy and Tenure*.—State authorities should give attention to the forthcoming report of the Special Committee on Land Tenure appointed by the President; and should on the one hand promote ownership and permanent occupancy, and on the other hand make more equitable the position of those who continue as tenants. They should explore the possibilities of elimination of oral leases, standard forms of leases, longer duration of leases, bettering the position of tenants with respect to improvements and fixtures which they have introduced, and other factors which would improve the position of tenants and encourage conservation of soil assets.

III. LOCAL ACTION AND ITS IMPORTANCE

The success of a long-time plan for essential readjustments in the Great Plains economy in the final analysis will depend on local action even more than on Federal or State action. The Federal agencies may advise, assist, and coordinate, State agencies may administer permissive or mandatory legislation, but in the end local attitudes, policies, and actions are bound to be decisive. These can be guided and influenced—indeed, they must be if the downward trend is to be stopped—but they cannot be coerced.

Certain practical measures within the capacity of individuals and communities are here briefly suggested: (1) Enlargement of operating units and establishment of the family ranch or farm, or the cooperative grazing range; (2) major shifts in cropping plans to reduce the single "cash crop" and restore the more stable "balanced farm"; (3) flexible cropping plans, so that the nature of the crop each season can be adapted to the amount of moisture in the soil at planting time; (4) creation of feed and seed reserves against dry years, made economical by use of the pit silo; (5) conservation of soil moisture by such means as contour plowing and listing, contour strips, terracing, leaving of stubble and crop residue in the ground, and planting of sweet clover and winter rye on sandy soils; (6) supplemental irrigation where practicable at low cost; (7) utilization of springs, wells, and other local sources of water supply where stock is to be pastured; (8) the planting wherever practicable of trees and shrubs as windbreaks on borders of fields and around houses.

All agencies—Federal, State, local, and private—must cooperate in stimulating the adoption of these and other proved methods. They are a part of the intelligent adjustment to the ways of Nature which must take the place of attempts to "conquer" her. But primarily the responsibility rests on the people residing in the Great Plains States. Other agencies may encourage, inform, and assist them, but the final responsibility is, and must be, their own.

Organization for Readjustment and Development

The task of readjustment and development along the lines recommended in this report is urgent. The type of coordinated action necessary for progress will come slowly and painfully if left to "the natural course of events." At the present moment, and notwithstanding the bitter lessons of recent years, we see evidences of uncoordinated action that extends improper land use and if not arrested will lead to further retrogression. The wheat area seeded in the ten Great Plains States during 1936, including many unsuitable parts of the area, is reported by competent authority to be the largest on record. In view of such circumstances an immediate and definite implementation of the program here presented is imperative.

Some fifty or more important Federal agencies, in addition to State, county, and municipal governments and numerous types of districts which have been or will be formed under the provisions of State laws, touch the problem of the Great Plains at some point or another. To bring the work of these many agencies sharply to focus on the dominant problem, to prevent

overlapping and confusion, and to deal with problems which in the Great Plains have a large degree of uniformity, the establishment of a continuing territorial agency to promote the readjustments that have been discussed in this report, and to make effective a salutary long-range program, seems amply justified. This agency should be of such a nature as to bring about prompt, lasting, and fruitful coordination in the field.

Such an agency should not displace existing agencies or assume any administrative control over the operations which those bodies normally carry on. Its proper field should be that of a continuing study of the Great Plains problem as a whole and of endeavoring, by consultation, education, persuasion, and guidance, to integrate the efforts of all forces concerned toward a common objective. It should be given authority to call on the various Federal agencies functioning in the Great Plains for such information as may be required to make field coordination effective. Any department of the Federal Government should be afforded the opportunity of designating a liaison officer to represent it in its relations with the proposed agency.

It should aid in coordinating policies and researches of all agencies dealing with or concerned with the Great Plains; should supervise and coordinate the recommended program of land mapping; should help to make effective the educational efforts looking toward the conservation of the soil and water resources of the Great Plains; should report annually, with recommendations as to Federal legislation bearing on the Great Plains; and after consultation with the departments involved should be prepared to recommend to State and local political subdivisions such legislation as may be deemed desirable.

The precise manner in which the proposed agency may be woven into the administrative fabric of the Federal Government may be left for later determination. In time to come it might well be a part of a Nation-wide effort toward better planning and greater coordination in the care and use of our natural and human resources. For the time being the task might fittingly be assigned to some more or less temporary committee, council, or commission, created by Executive Order, for the purpose of dealing with a situation which cannot wait.

Public opinion throughout the Great Plains appears to be ripe for this step, and there can be no doubt that the various agencies, Federal, State, and local, which are at work in the Great Plains area, will welcome some general, coordinated plan which will make each move more effective because it is part of a common effort.

During recent years the economic drift in the Great Plains has been steadily downward. If the deplorable consequences, recently heightened as a result of the depression and drought, are to be arrested, it will only be because the entire Nation takes the situation in hand promptly, emphatically, and competently. There is no controversy as to ultimate objectives, and there should be none as to immediate means.

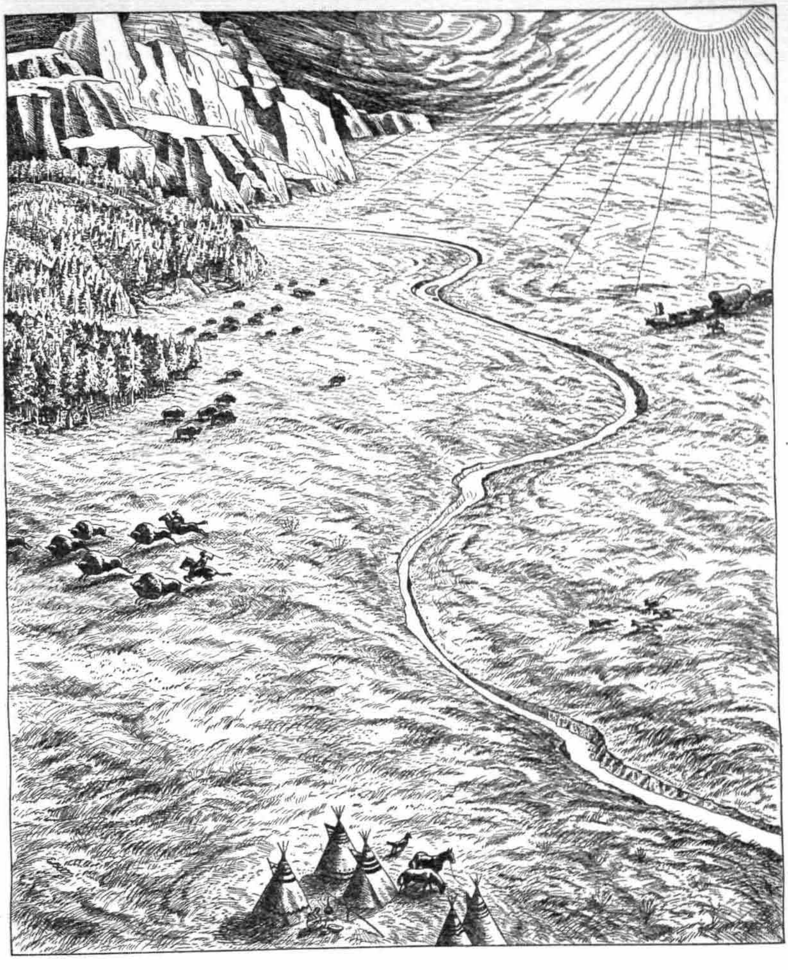
In a sense the Great Plains afford a test of American ways of dealing with matters of urgent common concern. They have not responded favorably to a purely individualistic system of pioneering. The Committee is confident that they will respond to an altered system which will invoke the power of voluntary cooperation without sacrificing any of the virtues of local initiative and self-reliance.

A PICTORIAL SURVEY OF THE GREAT PLAINS

*

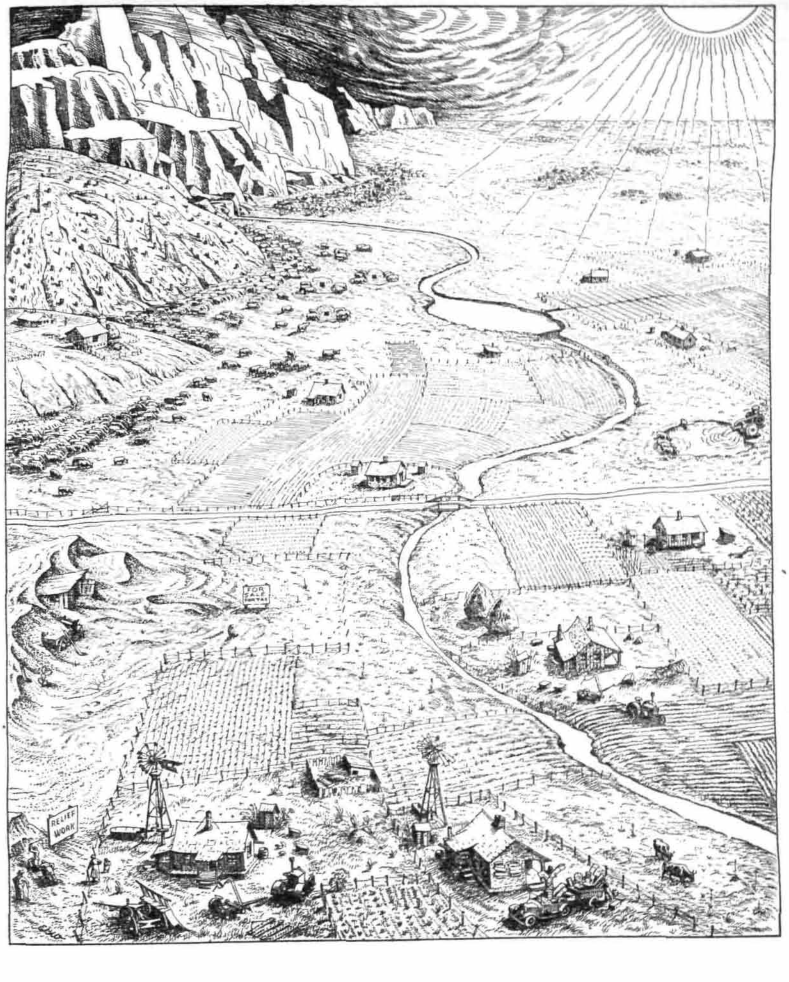
THE GREAT PLAINS OF THE PAST

As the first white settlers drove their covered wagons slowly westward across the seemingly limitless expanses of the Great Plains they found the Red Man living in rude but productive harmony with Nature. The Winter snows and Spring rains clothed the land in grass; forests covered the foothills and lined the upper reaches of clear streams; the buffalo furnished food, clothing, shelter, and other simple necessities without diminishing in number. Living as he did, the Indian could laugh at the burning sun, the strong but dustless winds. He had made his truce with them, and with the land.



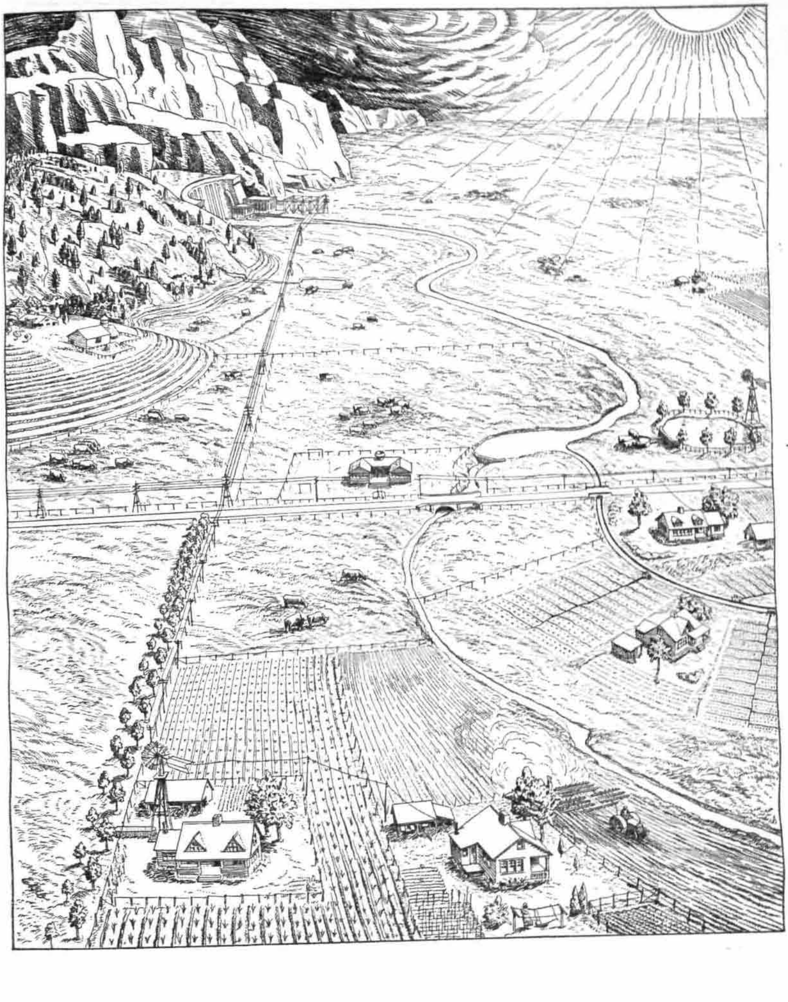
THE GREAT PLAINS OF THE PRESENT

The White Man knew no truce. He came as a conqueror first of the Indian, then of Nature. Today we see foothills shorn of timber, deeply gullied, useless or rapidly losing their fertile soil under unwise cultivation; the fertile earth itself drifts with the wind in sand hills and in dust clouds; where once the grass was rank, cattle nibble it to the scorched roots; the water of streams and the ground waters too often irrigate poor land, leaving the richer thirsty; men struggle vainly for a living on too few acres; the plough ignores Nature's "Keep Off" signs; communities, for all the courage of their people, fall into decay, with poor schools, shabby houses, the sad cycle of tax sales, relief, aimless migrations.


FOR SALE
RELIEF WORK

THE GREAT PLAINS OF THE FUTURE

The land may bloom again if man once more makes his peace with Nature. Careful planting will give him back the foothill trees; terracing will save lush foothill farms; a wise use of the land will restore grass for controlled grazing; fewer and larger farms on scientifically selected sites may yield under the plough a comfortable living; dams will hold back the waters from rains and melting snow, giving power and controlling the flow of the life-giving streams; springs may be developed, water pumped by windmills to water cattle, moisture held in the soil by scientific methods of tillage; by such means the life of man on the land may be made happier, more prosperous, more secure. The sun, the wind, the rain, the snow can be friends of man, not enemies. This is no Utopian dream. It is a promise, to be realized if we will.



Part I

*

GENERAL PHYSICAL CHARACTERISTICS OF THE AREA

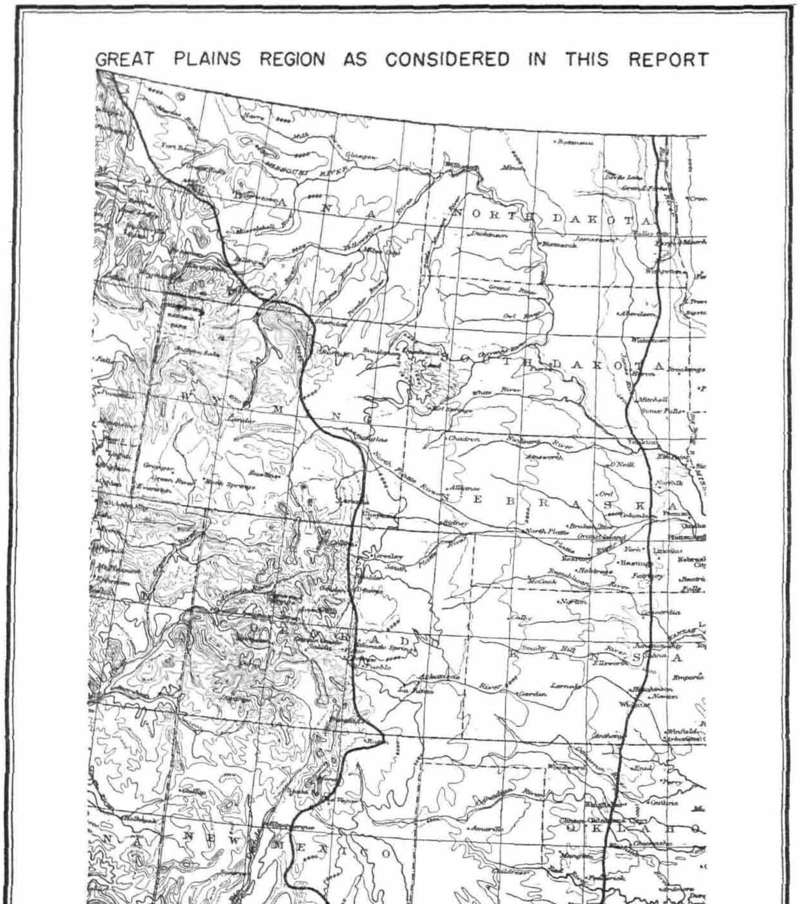

GREAT PLAINS REGION AS CONSIDERED IN THIS REPORT
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
NEW MEXICO
RESETTLEMENT ADMINISTRATION

FIGURE 1

Chapter I

PHYSICAL CHARACTERISTICS

Extent and Boundaries

The Great Plains Region, as delimited for the purposes of this report,[1] is shown in Figure 1. It comprises approximately one-third of the area between the Rocky Mountains and the Mississippi River and is about half the size of that part of the United States which lies east of the Mississippi. Stretching from Canada nearly to Mexico, it is about 1,300 miles long and varies from 200 to 700 miles in width. The Rocky Mountains form its western boundary, but no clear-cut line defines its eastern edge, which may be designated approximately in terms of (1) climate, (2) soil, or (3) natural vegetation. Figure 2 shows the approximate position of the natural boundaries which might be considered as marking its eastern limit, on the basis of these tests, together with the definite western boundary which is the eastern edge of the Rocky Mountain Region.

Since many crops cannot be grown dependably by conventional practices where the annual rainfall is less than 20 inches, agriculture without irrigation in the Great Plains generally is believed to be limited to grazing and to the production of relatively drought-resistant crops. Much significance, therefore, is attached to the 20-inch rainfall line zone as it runs from the Canadian border to the Gulf of Mexico.[2]

As the Great Plains are crossed from west to east, the color of the soil in general becomes darker and the layer of lime carbonate accumulation drops farther and farther below the surface. Finally a belt is reached in which this layer disappears altogether as the heavier rainfall causes the carbonate to be leached completely from the soil. To some investigators, the boundary between the soils which have lime carbonate accumulation and those which do not represents the eastern edge of the Great Plains and the western edge of the humid lands.

Generally the Great Plains Region is one of grasses, devoid in most places of trees. Recent experiments have indicated, however, that certain species of trees will survive and mature in the more favorable situations if not destroyed by grazing, fire, or other means. Early pioneers noted a decrease in the height of the vegetal ground cover as they moved westward toward the mountains. In general the vegetation of the Great Plains consists of species which are without exception drought enduring, able to enter a drought rest stage when necessary, and able to produce seed in a remarkably short time. Grama and buffalo grass are generally the most conspicuous species, but the taller grasses characteristic of the region of more abundant moisture to the East are present in a subordinate role. They become easily visible only during the occasional humid years, if not overgrazed. In the

[1] See Appendix 1, The President's Letter of Instructions. [2] Since temperatures and wind velocities affect the rate of evaporation, lines showing varying amounts of effective precipitation, based on a composite of rainfall, temperatures, and wind velocities would be more satisfactory indicators of the suitability of various areas in the Great Plains for crops than simple rainfall lines. See C. Warren Thornthwaite, "The Great Plains", p. 221, in *Migration and Economic Opportunity*, by Carter Goodrich and others.

GREAT PLAINS REGION AS CONSIDERED IN THIS REPORT
WITH VARIOUS NATURAL BOUNDARIES WHICH MIGHT BE CONSIDERED THE EASTERN LIMIT OF THE GREAT PLAINS REGION
MONTANA
NORTH DAKOTA
MINNESOTA
WEST BOUNDARY OF PEDALFERS (HUMID SOILS)
IDAHO
SOUTH DAKOTA
WISC
20 INCH RAINFALL LINE
WYOMING
NEBRASKA
IOWA
UTAH
COLORADO
KANSAS
MISSOURI
TALL GRASS EAST OF LINE SHORT GRASS WEST OF LINE
ARIZONA
NEW MEXICO
OKLAHOMA
ARKANSAS
BOUNDARY OF GREAT PLAINS REGION AS CONSIDERED IN THIS REPORT
TEXAS
LOUISIANA
BOUNDARY OF THE GREAT PLAINS PHYSIOGRAPHIC PROVINCE*
*AFTER NEVIN M. FENNEMAN AND THE U.S.G.S. PHYSIOGRAPHIC COMMITTEE
RESETTLEMENT ADMINISTRATION
LU 1-M-189

FIGURE 2

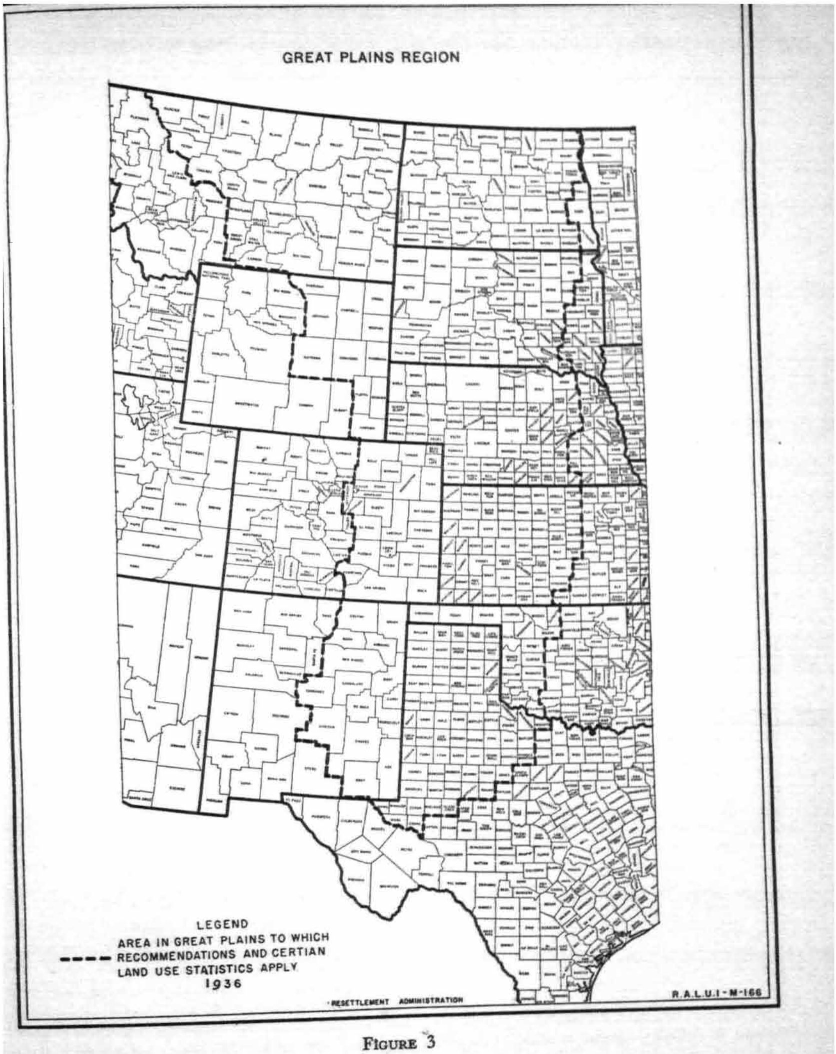

GREAT PLAINS REGION
LEGEND
AREA IN GREAT PLAINS TO WHICH
RECOMMENDATIONS AND CERTIAN
LAND USE STATISTICS APPLY
1936
RESETTLEMENT ADMINISTRATION
R.A.L.U.I-M-166

FIGURE 3

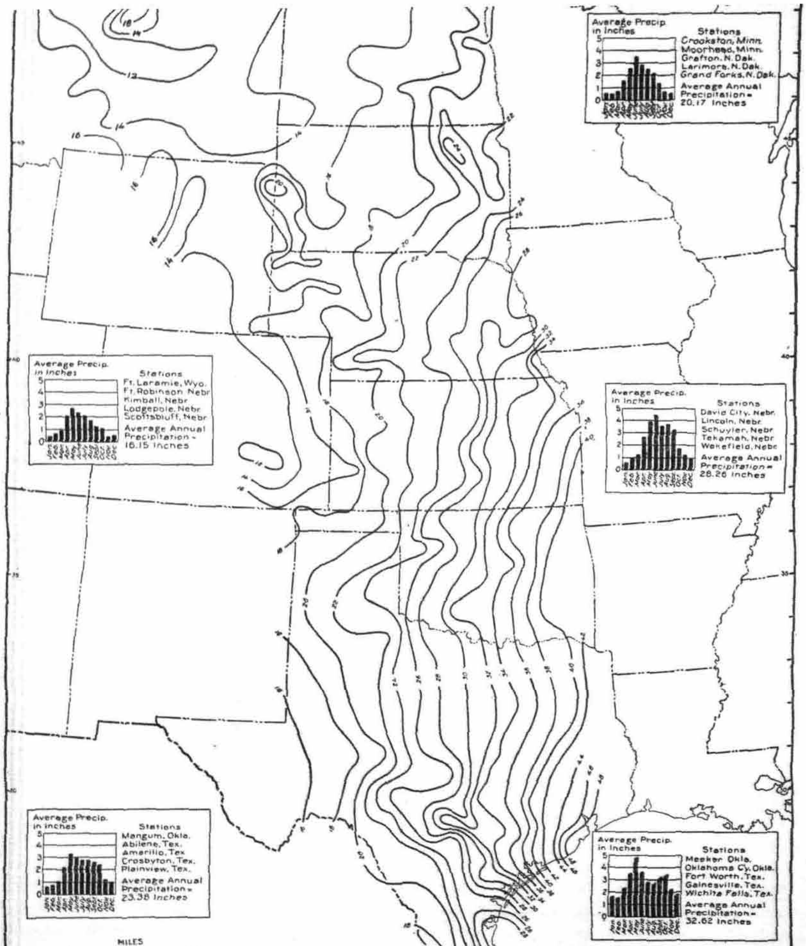


FIGURE 4.—*Average annual precipitation in inches for the 40-year period 1895–1934, together with typical monthly distribution charts for various parts of the Region*

sandy areas where the soil moisture is more readily available, the tall grasses of the prairies are usually found together with such woody plants as sage, wild plum, and shinry.

The taller components of the "short grass" suffer most during years of deficient rainfall as well as from overgrazing and other abuses. Some ecologists believe that the climax vegetation of the Great Plains is tall grass, and that it has disappeared because of overgrazing and other abuses, but would return if these abuses were to cease. They feel that the present dominant species—buffalo and grama grass—exist because they alone were able to survive misuse. In any event, the various attempts to delimit the boundary between short grasses and tall grasses have not been very successful because of its indefiniteness and its tendency to shift widely with variations in rainfall. This makes it impracticable to draw a definite "grass line" through the area where the Great Plains merge with the central prairies of the Mississippi Valley.

Figure 3 shows the boundaries of the Great Plains Region according to county lines, which are used to delimit the area to which estimates regarding public-land acquisitions and the like apply. The eastern boundary in this instance has been drawn to include within the Region all the important tracts where major readjustments in land use appear necessary or desirable to meet climatic conditions.

Climate of the Great Plains

The land-use problems of the Great Plains arise largely from the climate of the Region. The most important factor in the climate is the rainfall, light and extremely uncertain, which impedes or precludes the establishment of a humid or even a subhumid agricultural economy. The irregular but persistent recurrence of severe drought, wide fluctuations in temperatures and winds, and the general failure of settlers to adjust their agricultural practices to these hazardous conditions, are chiefly responsible for the peculiar problems and the economic maladjustments which characterize the Plains province.[3]

Rainfall Variability.—As may be seen from Figure 4, the average annual precipitation of the Great Plains is less than 20 inches, whereas in most of the remaining agricultural sections of the United States the average is 30 inches or more. However important this general deficiency in moisture may be, it is climatic variability that is the most critical factor in the permanent settlement of the Plains, since this is the basis of most of the agricultural risks of the Region. Areas which are humid or subhumid in some years are semiarid or arid in others. Marked variations occur not only from year to year but also in irregular minor cycles of several years' and in major cycles of many years' duration.

The rainfall record of Hays, Kansas, one of the longer records available (it dates from 1868), may be used to illustrate the annual and cyclic variations in precipitation that are characteristic of the Great Plains, even though it reflects conditions on the eastern, more favorable edge of the Region. "A computation of ten-year moving averages for the 67 years reveals three periods of scanty rainfall and two intermediate periods of more abundant precipitation. The heaviest average rainfall for any consecutive ten years was 26.52 inches for the period 1896–1905, and the lowest was 20.60 inches for the period 1915–25. The highest five-year average was 30.64 inches for the period 1874–78, and the lowest was 17.87 inches for 1891–95. The driest of the five-year periods received only 58 percent as much rain as the more humid years. Of the seven times since 1868 when the annual precipitation exceeded 30 inches, three were between 1875 and 1878. Only twice since 1903 has more than 30 inches of rain fallen in a single year. In 1894, the driest year, the rainfall was only 11.80 inches, whereas in 1874, the rainiest year, it amounted to 35.40 inches, exactly three times as much."[4]

[3] Thornthwaite, p. 202. [4] Thornthwaite, p. 219.

Data for other stations in the Great Plains that have relatively long records demonstrate similar annual fluctuations in precipitation. These data do not, however, reveal the greater and perhaps more significant variability in rainfall within an individual year. Frequently one or two rainless months may be followed by several intermittently rainy months. The variability of the monthly sequence of rainfall, as well as that of the annual totals, is a limiting factor in agricultural production in the Great Plains.

Were it possible to foresee shifts in climatic conditions and to adjust cropping plans accordingly, the risk involved in agricultural operations could be reduced notably. Most experts believe this is not yet practicable, although some authorities believe that measurements of the moisture content of the soil at seeding time can be employed as a practicable guide for cropping plans.[5] "Apparently there is no cyclical recurrence of rainfall conditions which can be reduced to a simple mathematical expression that would permit forecast through extrapolation. Evidence derived from tree rings, lake levels, etc., indicates that in the Great Plains the period from 1825 to 1865 was a long drought with only occasional wet years. * * * On the basis of that experience we may assume that the present drought might be prolonged for 20 or more years. Since rainfall averages now stand far below the normal, it is safe to forecast an increase throughout the drought area, but we have no reason to expect it immediately nor to regard the occurrence of a single wet year as the conclusion of the drought. Until further advance is made in the field of accurate long-range weather forecasts, there is no way of anticipating climatic variations." [6]

Local Climatic Variations.—Climatic conditions vary not only temporally but also spacially. "A further difficulty in the way of forecasting is that the oscillations are neither uniform, similar, nor synchronous in the various parts of the country. If any relationship exists between the various rainfall patterns through the United States, it has not been determined. Even in an area of such surficial homogeneity as the Great Plains there is no uniformity in rainfall throughout its extent. * * * In certain years, exceptionally dry or wet conditions pervade the entire area, as in 1910 and 1915. More frequently there is no consistent pattern of rainfall abnormality from north to south or from east to west.

"A considerable portion of the rain falls in showers of local character and, as a result, within short distances rather great variations may occur in individual rains. It is not unusual for successive rains to be so distributed that the moisture differences in adjacent places may become considerable. * * * Local variations in rainfall occur in humid areas also, but they are especially significant in the Great Plains because they determine the success or failure of crop production by rising above or dropping below the necessary requirements." [7]

Temperature Variability.—The land-use problems created by uncertain rainfall in the Great Plains are aggravated by wide fluctuations in temperature. The variation between maximum summer and minimum winter temperatures frequently is well over 100 degrees, even in the southern High Plains of Texas. Even more important, however, are the protracted periods of high temperatures. Some sections have reported more than 25 days in one month with maximum temperatures above 100 degrees. It is believed that the high-temperature measure is of special importance to drought in the Great Plains, not only because it contributes to livestock destruction but even more because the greatly increased evaporation dries up water supplies and causes crops to wilt. It is reasonable to suppose, moreover, that such temperatures are above the critical limits for the growth of corn and wheat and that they would result in damage even if abundant moisture were available.

Great variation occurs in the areal distribution of days with high temperatures. Northern

[5] See p. 32. [6] Thornthwaite, p. 219. [7] Thornthwaite, pp. 219–221.

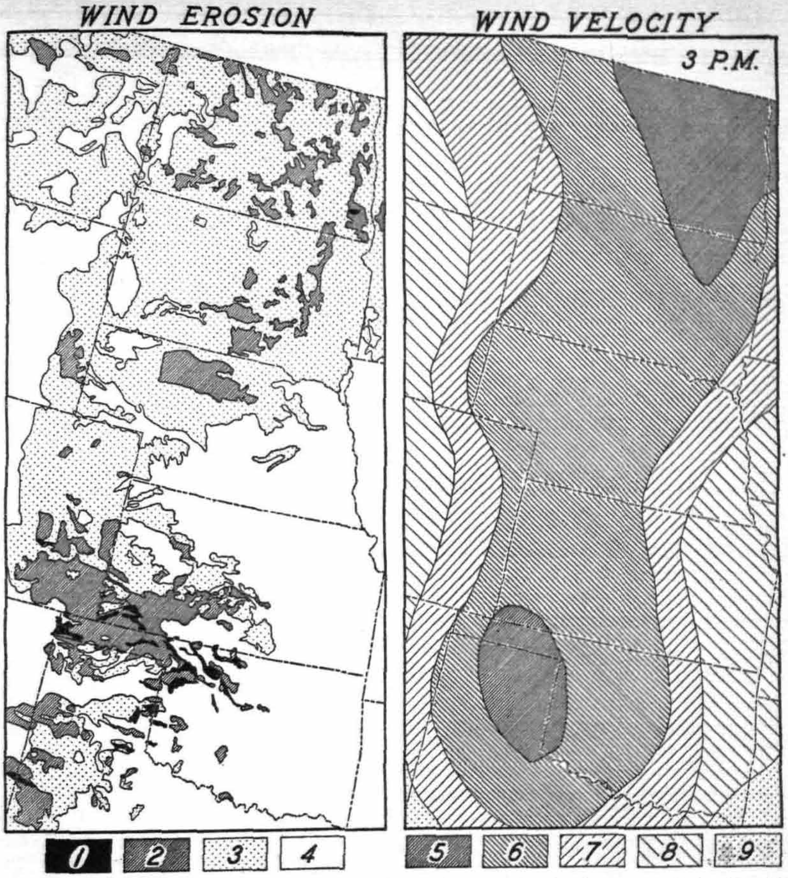


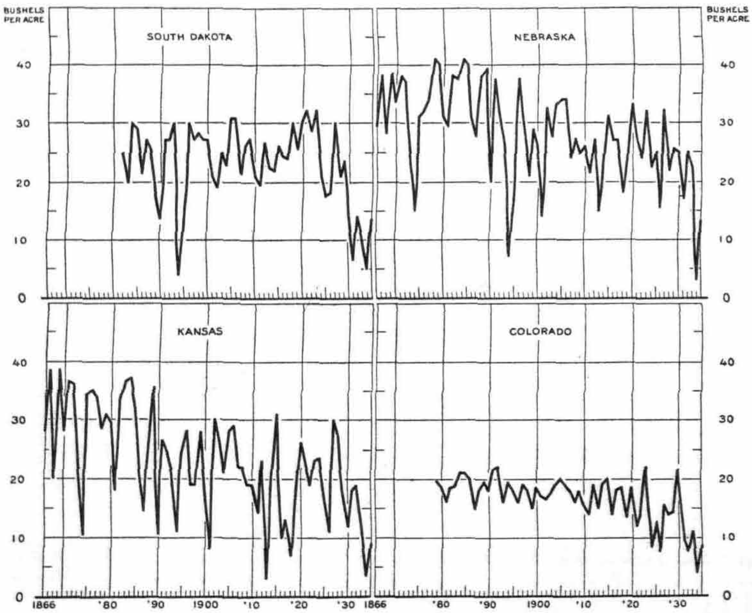
FIGURE 5.—*Wind erosion and average wind velocity in the Great Plains.* (*1*) *Very severe wind erosion,* (*2*) *Severe wind erosion,* (*3*) *Slight wind erosion,* (*4*) *Little or no wind erosion,* (*5*) *Sixteen to eighteen miles per hour,* (*6*) *Fourteen to sixteen miles per hour,* (*7*) *Twelve to fourteen miles per hour,* (*8*) *Ten to twelve miles per hour,* (*9*) *Eight to ten miles per hour.*—By permission from *Migration and Economic Opportunity,* p. 238, by Carter Goodrich and others; University of Pennsylvania Press.

Texas, for example, may report 30 or 31 days with maximum temperatures higher than 100 degrees during a month in which most of North Dakota has only two days with such temperatures. The next year the situation may be reversed. The number of days with maximum temperatures over 100 degrees may be half the number previously experienced in one area, while another area may report such temperatures for five times as many days as before.

Another important phase of temperature variation in the Great Plains is the length of the frost-free season, especially in the northern portion. In one year out of five the growing season in the extreme north may be expected to be shorter than 100 days. Killing frosts in autumn constitute a real danger to the spring wheat crop when planting is delayed or in extremely wet years. Early freezing, by preventing any further absorption of rain, may cause a serious deficiency in soil moisture the following year.

High Wind Velocity.—In no other section of the interior of the United States are prevailing wind velocities as high as in the Great Plains. Throughout most of the area velocities average

CORN: YIELD PER ACRE IN SELECTED STATES, 1866-1935



U. S. DEPARTMENT OF AGRICULTURE NEG. 31530 BUREAU OF AGRICULTURAL ECONOMICS

FIGURE 6

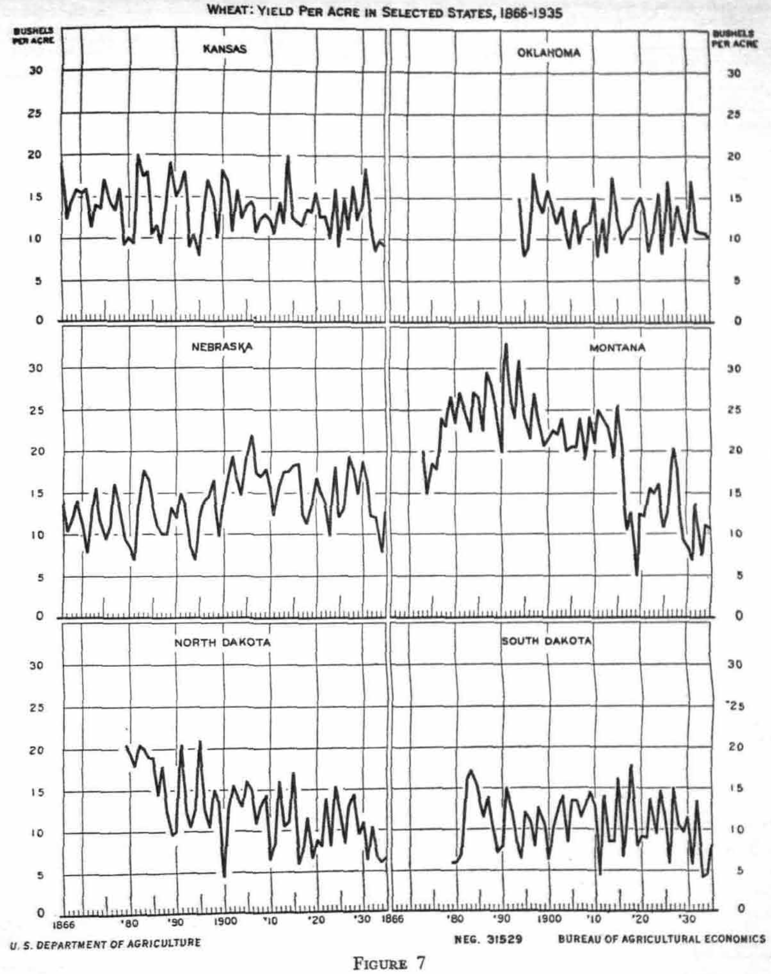

WHEAT: YIELD PER ACRE IN SELECTED STATES, 1866-1935
BUSHELS PER ACRE
KANSAS
OKLAHOMA
NEBRASKA
MONTANA
NORTH DAKOTA
SOUTH DAKOTA
30
25
20
15
10
5
0
1866
'80
'90
1900
'10
'20
'30
U. S. DEPARTMENT OF AGRICULTURE
NEG. 31529
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FIGURE 7

10 to 12 miles per hour, but the average may run as high as 16 to 18 miles per hour in some sections. This high rate of air movement increases evaporation, intensifies droughts caused by rainfall deficiencies and high temperatures, and promotes dust-blowing on cultivated fields. The relation between wind velocity and the amount of wind erosion in the Great Plains is indicated roughly on the two maps in Figure 5. The areas of most severe wind erosion are largely those with average afternoon wind velocities of more than 14 miles per hour.

Climatic Variability and Crop Yields.—The most important effects of climatic variability are those on crops. They relate not only to current yields but also to the extent of plantings in following years. Crop yields fluctuate notably in the Great Plains. As can be seen from Figures 6 and 7, average corn yields range from almost nothing to 40 or more bushels per acre, while average yields of wheat vary from 5 bushels to more than 30 bushels per acre, over entire States. Yields in the drier areas show even greater variations, with a higher percentage of failures or near failures. Even more significant are the extreme fluctuations in net farm income, to be considered later.

Climatic Variability and Water Supply.—Climatic variations also affect agriculture in the Great Plains through their influence on the water supply, which is largely conditioned by the scant and undependable rainfall and the rate of run-off and evaporation. The unreliability of the water supply in many parts of the Great Plains is therefore one of the major hazards confronting human activities in the Region. The drying up of springs, wells, and water holes, the necessity for hauling water for stock, the transportation of stock from drought-stricken areas, and the final abandonment of farms for want of water have repeatedly and recently presented deplorable evidence of the tragic effects arising from this hazard.

Climatic Change.—The deep concern occasioned by the recent series of droughts, the attendant dust storms, and the consequent disastrous reduction in crop yields and farm incomes has raised again the question of the possibility of a progressive drying up of the Great Plains. Newspapers printed during the droughts of the early nineties record similar apprehensions. The longest rainfall records within the area are of insufficient length to yield adequate evidence on this subject. Such data as are available, however, suggest that farmers there are not facing permanently increased aridity but rather are suffering from the protracted variations of rainfall which have been characteristic of the Region since its first settlement. If the climate really *is* changing, the rate apparently is so slow that the trend need not be a matter for practical consideration in the present crisis.

Contrary to opinions sometimes expressed, there is no evidence that plowing up the range in the Great Plains, or the drying up of lakes and ponds, has reduced the average precipitation, though it has affected its availability materially. It is recognized, however, that the modes of cultivation dominant in the Region have tended to intensify the serious effects of periods of deficient precipitation. Physical alteration of the soil and loss of organic matter through deterioration and erosion bring about increased moisture losses through surface run-off and evaporation and reduce the amount of moisture that remains available for plant growth. Moisture-conserving methods of farming would serve in many localities to ameliorate the effects of droughts.

In this connection it should be noted that recent experiments [8] indicate that periodic measurements of soil moisture and planting only when moisture is adequate, may permit, in many sections of deficient rainfall, profitable average annual yields.[9] On some of the heavier soils alternate planting and fallowing have given

[8] Among the public agencies which have carried on such experiments are the Division of Dry Land Agriculture, Bureau of Plant Industry, and the Oklahoma and Kansas Agriculture Experiment Stations. [9] Unpublished memorandum by Dr. F. E. Clements; see also F. E. Clements and R. W. Chaney, *Environment and Life in the Great Plains.*

favorable results in certain localities. It cannot be emphasized too strongly that the success of an agricultural economy in the Great Plains area pivots primarily on effective adjustment to climatic conditions.

Waters of the Great Plains

Paucity of water is the most striking characteristic of the Great Plains. Husbandry and intelligent use of available supplies of water are necessary if the Plains are to sustain an economic development permanent in character, free from violent fluctuations, and conducive to wholesome conditions of life.

Surface Waters.—The principal streams of the Great Plains originate in the Rocky Mountains and flow east and southeast from the Continental Divide toward the Mississippi River. The largest drainage basin is that of the Missouri River, the chief tributaries of which are the Yellowstone, the Platte, and the Kansas.

Such rivers as the Missouri, the Arkansas, and the Canadian are perennial in character though subject to great fluctuation in volume. Many of the Plains streams are not perennial; many carry flashy floods in spring and dwindle or disappear in summer.

The character of the flow of a stream will largely indicate the type of use to which it may be put. Streams of strong perennial flow are a dependable source of water for irrigation, but in the basins of most such rivers additional storage would be required for the reclamation of new lands. For the most part streams which originate in the Plains area are not dependable sources of water for highly developed irrigation practice unless large amounts of storage are provided.

Moreover, the low water flow of such streams may be so highly impregnated with salts that it is unsuitable for irrigation.

Irrigation in the Great Plains has been undertaken chiefly along the perennial streams and has been carried to a point where the minimum flow is scarcely sufficient to provide the required water. Since the only large source of water in the Great Plains which might be used for additional irrigation is the Missouri River, further development would have to depend largely upon importing water from other watersheds. On the other hand, storage has not been developed to its maximum in most sections. Moreover, because of infrequent requirements, irrigation with surface waters has not been practiced generally in the eastern portion of the Great Plains, although the flow of various streams increases to the eastward and dependable supplies of water could be obtained in some instances.

Ground Waters.—Ground-water supplies in the Great Plains are found both near the surface and at considerable depths. The shallow deposits generally are found in alluvial valley bottoms, buried valleys, and glacial drift. The deep deposits are in rock formations most of which outcrop along the eastern flank of the Rocky Mountains; they are extensively used for domestic, municipal, and stock-water purposes in some portions of the Region. Although deep waters have not been used much for irrigation, shallow waters have been so utilized in the southern part of the Great Plains. Future irrigation with water from alluvial sands in river valleys can be anticipated in all areas where pumping is now taking place. In addition, irrigation with ground waters as well as surface waters may prove feasible in some areas along the eastern margin and in the northern portion of the Great Plains. However, most of the new large-scale projects are of doubtful feasibility, if that be measured in accordance with requirements of the national reclamation law, under which construction costs must be repaid without interest in forty years. Water for livestock can be obtained generally over the southern half of the Region from deep wells, but over great areas of the northern half the depth to water-bearing formations is prohibitive under present conditions.

The problem of the depletion of water supplies will be considered in a later chapter.

Soils of the Great Plains

The soils of the Great Plains possess great diversity in the characteristics which critically influence land use, even within small areas. The great range and variety in the soil characteristics of a representative area in the southern Great Plains are indicated on Figure 8. Many differences which only a large-scale map could show are not discernible.

This variation in soils, particularly in their capacity for holding water and releasing it for plants, as well as their capacity for resisting erosion, points to diversity, even within small areas, in the types of land use which are economic, and implies that in general a single type of land-use adjustment should not be sweepingly applied to large districts. Indeed, the soil pattern is so intricate that on most farms of 320 acres or more there are likely to be several kinds, each having characteristics which affect its productivity and its value for crops and pasture. Diversity in the land, including its soils and its surface, is reflected in the remarkable range and variation in average crop yields within relatively small areas, as illustrated by Figure 9.

Generally the soils of the Great Plains are suitable in texture, inherently fertile, and without need for lime or commercial fertilizers. Most critical among soil characteristics in their effects on land use are texture, structure, and depth, which influence the water-absorbing and water-holding capacity of the soils. Differences in texture account for important local variations in soil moisture availability and crop adaptability. Soils with fine-textured surface material, such as clay or clay loam, have high power to retain water once it is absorbed, but absorption is accomplished so slowly that much of the precipitation serves no productive purpose because it is lost in run-off or through evaporation. Hence the yield from "heavy" soils has a tendency to be more seriously affected by prolonged drought than that from more permeable soils.

Sandy soils absorb rapidly a large percentage of the precipitation, which penetrates deeper than in fine-textured soils. Hence shallow-rooted crops, such as wheat, do better on fine-textured soils, or "hard" lands, than on sandy soils; whereas deeper rooted crops, such as corn, cotton, or sorghum, grow successfully on some sandy soils. Ground water replenishment by percolation takes place on the loose sandy soils, but in the fine-grained soil surface water seldom penetrates to the water table. The lower limit to which it normally percolates is marked by a zone of lime-carbonate accumulation in the subsoil. Sandy soils cannot be made to cling together in aggregates too large to be blown, as can fine-textured soils; consequently, wind erosion cannot be controlled so easily on sandy land as on hard land. In the main, the areas of predominantly loose sandy character, like the great Sand Hill Region of Nebraska, must be left in grass to prevent blowing.

Other local soil characteristics which markedly influence the supply of soil moisture in this Region are porous layers of gravel or coarse sand at varying depths beneath the surface, and dense or indurated subsoil layers known as hardpans or claypans.

The complexity of the pattern of soil characteristics which influence land use is further increased in certain areas by excessively salty or alkaline lands, or soils impregnated with selenium, by spots of "exposed caliche", by shallow soils, or, in the glaciated region, by great variations in stoniness. Aside from these factors, the slope of the land which also exhibits great local variation, influences considerably the supply of soil moisture by affecting the rapidity of run-off.

It is probably safe to say that most of the uneconomic crop farms are subject to excessive droughtiness because of poor absorptive capacity or because of erosion. Yet in this connection it should again be noted that some of these lands may prove to be suitable for cropping if operations are scheduled in accordance with indices of cumulative soil moisture-content.

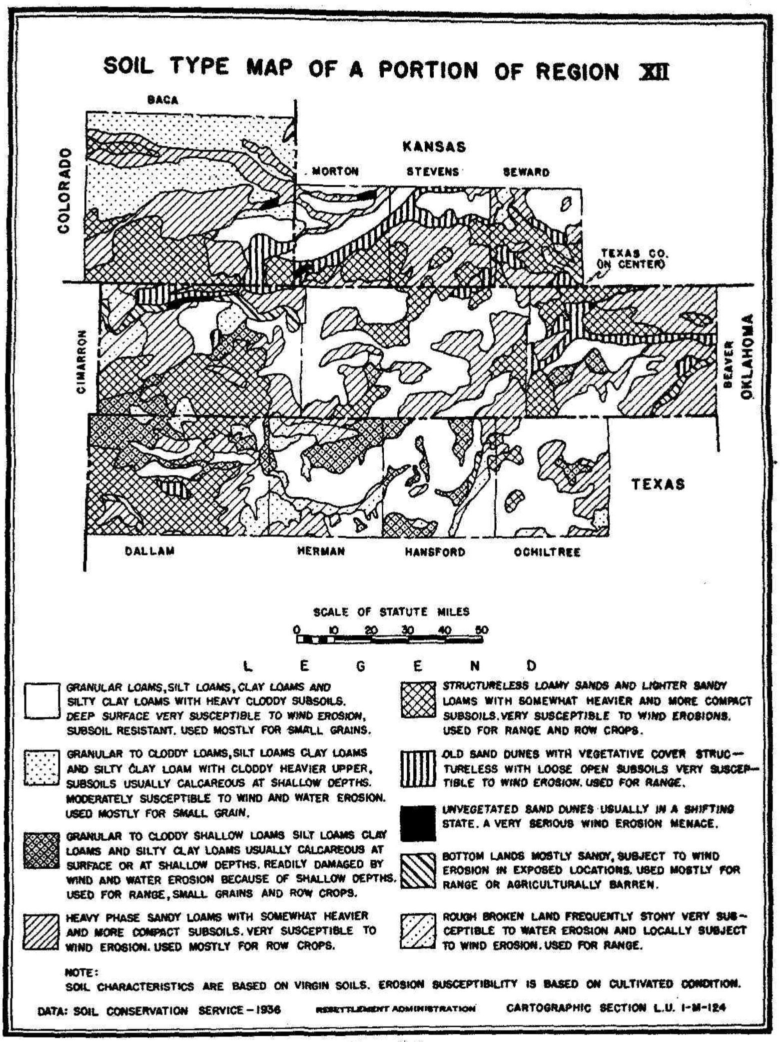
SOIL TYPE MAP OF A PORTION OF REGION XII
BACA
COLORADO
KANSAS
MORTON
STEVENS
SEWARD
TEXAS CO. (ON CENTER)
CIMARRON
BEAVER
OKLAHOMA
TEXAS
DALLAM
HERMAN
HANSFORD
OCHILTREE
SCALE OF STATUTE MILES
0 10 20 30 40 50
LEGEND
GRANULAR LOAMS, SILT LOAMS, CLAY LOAMS AND SILTY CLAY LOAMS WITH HEAVY CLODDY SUBSOILS. DEEP SURFACE VERY SUSCEPTIBLE TO WIND EROSION, SUBSOIL RESISTANT. USED MOSTLY FOR SMALL GRAINS.
GRANULAR TO CLODDY LOAMS, SILT LOAMS CLAY LOAMS AND SILTY CLAY LOAM WITH CLODDY HEAVIER UPPER, SUBSOILS USUALLY CALCAREOUS AT SHALLOW DEPTHS. MODERATELY SUSCEPTIBLE TO WIND AND WATER EROSION. USED MOSTLY FOR SMALL GRAIN.
GRANULAR TO CLODDY SHALLOW LOAMS SILT LOAMS CLAY LOAMS AND SILTY CLAY LOAMS USUALLY CALCAREOUS AT SURFACE OR AT SHALLOW DEPTHS. READILY DAMAGED BY WIND AND WATER EROSION BECAUSE OF SHALLOW DEPTHS. USED FOR RANGE, SMALL GRAINS AND ROW CROPS.
HEAVY PHASE SANDY LOAMS WITH SOMEWHAT HEAVIER AND MORE COMPACT SUBSOILS. VERY SUSCEPTIBLE TO WIND EROSION. USED MOSTLY FOR ROW CROPS.
STRUCTURELESS LOAMY SANDS AND LIGHTER SANDY LOAMS WITH SOMEWHAT HEAVIER AND MORE COMPACT SUBSOILS. VERY SUSCEPTIBLE TO WIND EROSIONS. USED FOR RANGE AND ROW CROPS.
OLD SAND DUNES WITH VEGETATIVE COVER STRUCTURELESS WITH LOOSE OPEN SUBSOILS VERY SUSCEPTIBLE TO WIND EROSION. USED FOR RANGE.
UNVEGETATED SAND DUNES USUALLY IN A SHIFTING STATE. A VERY SERIOUS WIND EROSION MENACE.
BOTTOM LANDS MOSTLY SANDY, SUBJECT TO WIND EROSION IN EXPOSED LOCATIONS. USED MOSTLY FOR RANGE OR AGRICULTURALLY BARREN.
ROUGH BROKEN LAND FREQUENTLY STONY VERY SUSCEPTIBLE TO WATER EROSION AND LOCALLY SUBJECT TO WIND EROSION. USED FOR RANGE.
NOTE:
SOIL CHARACTERISTICS ARE BASED ON VIRGIN SOILS. EROSION SUSCEPTIBILITY IS BASED ON CULTIVATED CONDITION.
DATA: SOIL CONSERVATION SERVICE - 1936
RESETTLEMENT ADMINISTRATION
CARTOGRAPHIC SECTION L.U. I-M-124

FIGURE 8

Frequently, where neither of two successive years of deficient moisture will give a crop, a biennial crop will be realized if the moisture of one year is saved and added to that of the next.

Differences Between the Great Plains and Other Areas

The significant difference between the Great Plains and more humid or more arid areas lies in the fact that the rainfall of the Plains varies widely around a critical point for crop production, and even a slight reduction of moisture affects crop yields seriously. In the humid areas east of the Great Plains and in those along the Pacific Coast, absolute variations in rainfall may be greater than in the Plains, but in such areas the rainfall seldom falls below the minimum required for crop production. In the desert areas of the intermountain regions, the percentage variation in rainfall may be greater than in the Great Plains, but even so, these areas seldom rise above their desert character. But in the Great Plains the climate hovers around the point critical for vegetation; depending on the locality and the year, it may be moist, subhumid, or dry—subhumid one year and semiarid or arid the next.

Such are the basic physical conditions governing the economy, consisting chiefly of agriculture, in the Great Plains. Obviously, to enjoy the maximum security and stability obtainable under these conditions, a careful adjustment to them is essential. The extent to which such adjustment has been effected in the settlement and development of the Region, is considered in the following chapters.

GROUP OF TOWNSHIPS IN NORTHERN GREAT PLAINS SHOWING WHEAT YIELD PER ACRE, 5-YEAR AVERAGE, 1928-32

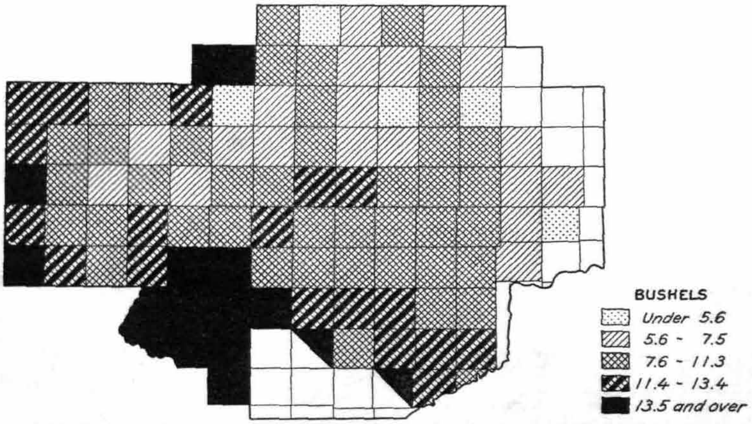

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Figure 9

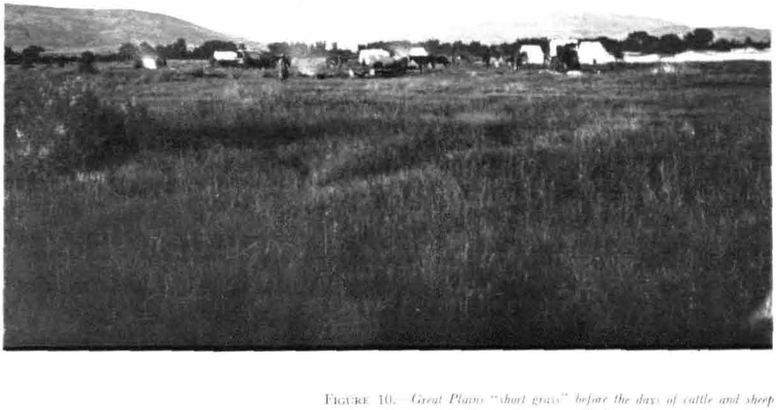


FIGURE 10.—*Great Plains "short grass" before the days of cattle and sheep grazing. Camp of the Hayden Expedition, 1870, on Plains at the north end of Casper Mountain, Natrona County, Wyoming. The luxuriance of the native grass can be seen in the heavy growth of wheatgrass* (Agropyron smithii) *and other grazing plants in the foreground. None of the present-day cover of sagebrush is to be seen. Photograph by W. H. Jackson, official photographer for the Hayden Expedition.* (U. S. Geological Survey photo.)

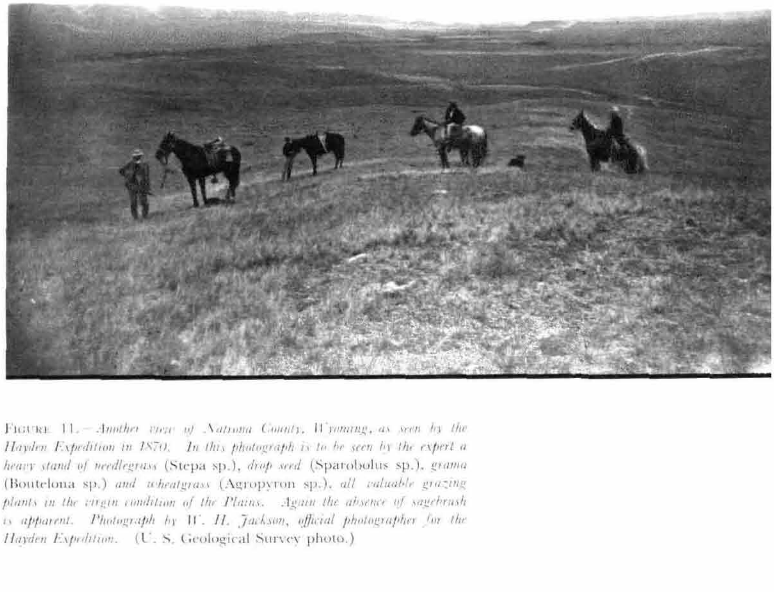


FIGURE 11.—*Another view of Natrona County, Wyoming, as seen by the Hayden Expedition in 1870. In this photograph is to be seen by the expert a heavy stand of needlegrass* (Stepa sp.), *drop seed* (Sparobolus sp.), *grama* (Boutelona sp.) *and wheatgrass* (Agropyron sp.), *all valuable grazing plants in the virgin condition of the Plains. Again the absence of sagebrush is apparent. Photograph by W. H. Jackson, official photographer for the Hayden Expedition.* (U. S. Geological Survey photo.)

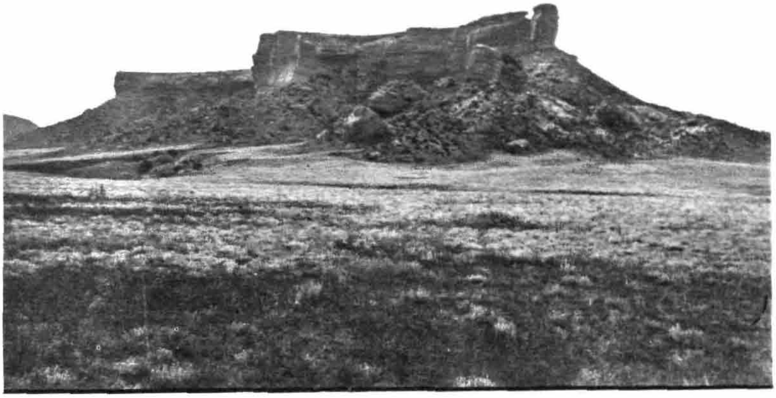


FIGURE 12.—*A third photograph of the Hayden Expedition, 1870, on Plains near the Chugwater River, Wyoming. Today sagebrush covers this area, but the Expedition saw a luxuriant stand of winter fat* (Eurotia Lanata) *and western wheatgrass* (Agropyron smithii), *both valuable forage plants. Photograph by W. H. Jackson, official photographer of the Hayden Expedition.* (U. S. Geological Survey photo.)

FIGURE 13.—*Well-grazed short grass composed of grama and buffalo grass.* (Dr. Frederic E. Clements photo.)

FIGURE 14.—*Protected mixed native grass within the enclosure; the same prairie grazed down to short grass beyond the fence.* (Dry Land Agricultural Experiment Station, Mandan, North Dakota, photo.)

FIGURE 15.—*Native mid and short grass long protected from grazing.* (Dr. Frederic E. Clements photo.)

Part II

*

USE
AND MISUSE
OF LANDS AND
WATERS

Chapter II

POPULATION, SETTLEMENT, AND LAND USE

Population

The Great Plains as outlined in Figure 3, with a total population in 1930 of 4,411,624,[1] of whom 2,561,164 lived in open country (total minus all incorporated places) and of these 2,235,228 were on farms, is a sparsely settled region. In only a few counties in 1930 was the average density per square mile, including towns, greater than 45, while in large areas it was less than two. Denver, with 288,000 inhabitants, is the largest city; no other approaches it in size. It follows that the problems of the Great Plains are essentially rural. Moreover, in view of the vast area over which the population is scattered, distance is an important factor in planning any program for the Region.

The fact that even the relatively small population of the Great Plains cannot be sustained adequately under present conditions has been demonstrated in recent drought years. The explanation lies as much in unwise land use as in climatic and other natural conditions. In part, the misuse of land has grown out of the history of settlement in the Region, in part, it derives from an attempt to apply a technique of land development not suitable for conditions in the Great Plains.

Characteristic Uses of Land

The total land area of the 399 Great Plains counties indicated in Figure 3 is 359,306,093 acres, of which 282,096,014 acres were in farms in 1935. Three general types of agriculture prevail in the area: grain farming, chiefly for wheat production,[2] with little or no livestock; combined grain farming and stock ranching; and stock ranching, with only sufficient crop production to supply feed to supplement the range. There are a number of irrigated valleys. In some of them stock feed is the principal crop; in others, such cash crops as cantaloupes and sugar beets are grown.

A considerable portion of the land lying outside of the farms as defined by the Census is public land or land held by absentee owners. It is used for grazing by nomadic stockmen or by nearby farmers or ranchers. The distribution of the land by type of utilization and by States is shown in Table 1.

TABLE 1.—*Distribution of land by type of use in Great Plains area*

State [1]	Number of farms	Acres in farms	Crop land [2]	Other land (chiefly pasture)	Land not in farms
Montana	37, 171	38, 444, 286	9, 133, 478	29, 310, 808	24, 228, 994
Wyoming	10, 150	17, 908, 397	1, 457, 548	16, 450, 849	5, 013, 843
Colorado	38, 353	20, 366, 110	7, 049, 643	13, 316, 467	8, 939, 165
New Mexico	17, 922	22, 105, 862	1, 915, 210	20, 190, 652	10, 904, 698
North Dakota	17, 753	36, 643, 406	22, 228, 247	14, 415, 161	5, 672, 112
South Dakota	52, 814	29, 832, 820	11, 804, 650	18, 028, 170	11, 360, 660
Nebraska	80, 540	37, 423, 329	16, 015, 841	21, 407, 488	2, 954, 611
Kansas	68, 957	28, 810, 428	17, 799, 278	11, 011, 150	2, 951, 492
Oklahoma	42, 403	12, 898, 109	6, 524, 679	6, 373, 430	639, 171
Texas	67, 985	37, 663, 267	13, 340, 613	24, 432, 624	4, 545, 333
Total	494, 048	282,096,014	107,269,187	174,936,799	77, 210, 079

[1] Includes only those portions of these States which are within the area outlined in *Figure 3*.
[2] Includes land in harvested crops, land on which crops failed, and crop land idle or fallowed.

[1] Excluding Denver County, Colorado.
[2] In the southern High Plains of Texas and New Mexico, and in Oklahoma, cotton replaces wheat as the principal cash crop.

Conditions Stimulating Unwise Settlement

The history of the development of the Great Plains has an important bearing on the present land-use pattern of the Region, and many of its problems have their roots in economic conditions, prevailing attitudes, and public policies reaching back into the sixties. Prior to 1860 the Plains Region was inhabited primarily by Indians and buffalo. Game migrated freely in search of better range, and the short grass of that period—somewhat longer and thicker than the short grass now dominant—thus was given an opportunity to maintain itself.

The Range Industry.—Penetration of railroads into Kansas after 1860 encouraged the driving of great herds of Texas cattle northward to Abilene and other shipping points in Kansas. Later, herds were pushed into Nebraska, the Dakotas, and Montana, first to provide meat for military posts and Indian reservations, and later to raise cattle for eastern markets. The capacity of the range then seemed unlimited, and the Great Plains were regarded as a cattleman's paradise.

About 1880 there developed a boom in the cattle industry characterized by ownership of large herds by companies financed chiefly by outside, generally European, capital. The number of cattle increased rapidly, and soon the range was fully stocked. The land of the Plains was still largely public domain, unfenced and unclaimed, except for extralegal claims established by the ranchers. Under this unregulated use, the reserves of taller grass were exhausted, leaving only buffalo grass and grama grass. Overgrazing became a problem, the seriousness of which increased as the carrying capacity of the range decreased.

The winter of 1886–87 was unusually severe, and great numbers of cattle perished. The prolonged drought which followed (1886–95) brought further losses to the cattle companies, and homestead settlement contributed to their difficulties. Under these circumstances, large-scale cattle ranching was gradually replaced by smaller operations under individual ownership, and the era of the cattle barons came to an end. The transition was nearly completed by 1895.

Development of Crop Farming.—Both foreign and domestic markets were favorable to agricultural expansion during the last half of the nineteenth century. The investment of foreign capital in the development of the West and the status of the United States as a debtor nation augmented a naturally large market abroad for American farm products. Industrial developments in the United States concurrently stimulated farm-to-city migration and foreign immigration, which in turn helped to create an ever-expanding domestic market. In response to these favorable circumstances settlement continued at a rapid rate, but until about 1880 it was confined largely to humid and subhumid areas east of the short-grass line. A little later railroad building greatly facilitated the establishment of permanent settlements farther west. They tended to spread out along the railroads rather than to follow, as formerly, the courses of streams. Another factor in settlement was the development of barbed wire which enabled the homesteaders to protect their land from grazing cattle.

Public Land Policy.—The lure of free land on the frontier under the Homestead Acts was the major influence in the settlement of the Great Plains. It gained force and direction from such factors as favorable market conditions, the development of railroad transportation, and the lure of free or cheap land, just as it wavered and receded in response to such adverse conditions as protracted drought and low prices. But throughout the settlement period free land greatly stimulated immigration and materially affected the pattern of settlement.

Public-land policy proved unfortunate in at least two respects, both of which are discussed in greater detail in subsequent sections. Speculation in land, with attendant abuses in its development, was facilitated. Moreover, the holdings permitted under the Homestead Acts were

so small as to stimulate overcultivation. Both factors tended to induce a more intensive use of land in the Great Plains than was justified by natural conditions.

Years of Abundant Rainfall and High Wheat Prices.—Periods of relatively abundant rainfall have been among the most potent influences in promoting settlement of the Great Plains. It can be seen in Figure 16 that the peak years of homesteading in Montana were from 1910 to 1917, well along in a period when the rainfall averages were the heaviest recorded to that date for four Montana stations. Preceding this period of adequate water supply there were several years during which the price of wheat rose. The sagging tendency noticeable from 1911 to 1913 was halted by the outbreak of the war, which gave impetus to a fresh advance. European demand was insatiable. Wheat, which normally had brought from 65 to 85 cents a bushel, soared to well over $2. It was alleged that wheat would win the war, and the western farmer was offered tangible inducements to produce it in great quantity.

New Farming Methods and Crop Varieties: Power Machinery.—After 1910 other factors entered the situation to carry the flow of settlement and the process of plowing up the prairies almost to the present time. Progress in methods of dry-farming stimulated the production of wheat. Varieties of spring and winter wheat were improved in drought resistance, uniformity in growth and ripening, and yield per acre.

Subsequent to the war, the advances in technique continued. With the increased use of tractors and other power machinery, production

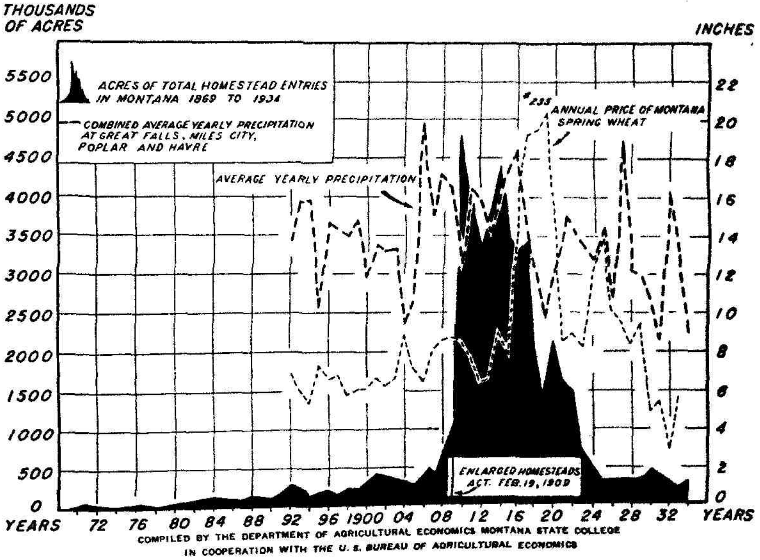


FIGURE 16

costs per acre were greatly reduced, particularly if operating units were large. Tractors by the thousands were shipped into the Plains country and thousands upon thousands of acres of original grass cover were soon turned under. In 1910 wheat growers in Kansas, for example, harvested 77,451,000 bushels from 5,974,000 acres; by 1919, 11,624,000 acres yielded 153,311,000 bushels; by 1931, the production on 13,623,000 acres reached 251,885,000 bushels. Similar expansion took place throughout most of the Great Plains Region, even in those sections which are especially likely to suffer from drought.

Combines, purchased in the same wholesale manner as tractors, added another reason for breaking up virgin sod; more acres could be seeded because more could be harvested. Prior to the coming of the combine, acreage had been held in check to some extent by the fact that farmers would not plant more than they could expect to harvest with safety.

The purchase of tractors and combines was made possible very largely through credit. Before their advent, a wheat grower could turn his horses out on the range and discharge his hired men when they were not needed, thus effectively cutting down his overhead expenses. But tractors and combines must be paid for, and cash was necessary to operate them. The only choice for the farmer was to roll out the heavy artillery of production, plow and seed as much land as possible, and then hope for adequate rain, a big crop, and a satisfactory price.

Lack of Knowledge of Diverse Conditions.—During the period of early settlement, few men understood the great range in productive capacity of smooth land on the Plains, much less the intricate details of the local distribution of lands of different character. It was assumed, accordingly, that if one section or half section gave a good yield of wheat, nearby sections would do likewise. This might hold in years of abundant rain, but in dry years differences in soils, especially in their moisture-absorbing and holding qualities, greatly altered the situation. With the coming of several consecutive years of low rainfall, lands which, because of their texture or the surface slope, failed to hold what rain did fall, yielded little or no grain. Furthermore, with little understanding of the differences in land character and their significance, and with little or no experience with water conservation on the land, farmers had no basis for making adjustments in the size of their farms to compensate for variations in the productive capacity of the land.

A similar lack of knowledge with respect to soil productivity has been responsible for the inclusion within some of the Great Plains reclamation projects of considerable bodies of land of such low productivity that the operators of farms on such land find difficulty in paying construction and operating charges on the irrigation works. In some instances such lands have not even been settled.

Speculation.—A strong speculative urge, as already noted, has been one of the driving forces in the development of the Great Plains. The majority of settlers probably intended to establish homes and farms for themselves, but the purpose of many was speculative gain. This was promoted by public land policy which, under an expansionist sentiment, gave little consideration to the long-run stability of the Region. Many speculators purchased land under the public land sale system which overlapped the homestead system and continued until 1891. In addition to extensive grants of land to railroads and to States, large tracts were engrossed by speculators through use of agricultural college scrip and other types of land warrants and scrip. Settlement in the Great Plains entered a boom phase which found the railroads, the States, private land companies, and, to a less extent, the Federal Government vying for settlers. Values became inflated and an unhealthy financial tone was given to settlement of the Region.

Chapter III

UNDESIRABLE TENDENCIES IN LAND USE AND TENURE

Undesirable Tendencies in Land Use

In the previous chapter it was pointed out that the origin of many problems of the Great Plains lay in the inappropriate use of land. Once excellent grazing country has been worn out through overstocking; land unsuitable for cultivation has been put to the plow; and even more serious, utilization of water resources—rainfall, surface waters, and underground waters—has not been coordinated properly with land use. This chapter is concerned with undesirable tendencies in this respect; their consequences will be explained in the next chapter.

Overstocking of Range Lands.—Like most other resources of the United States, the range originally seemed limitless. For many years it was free. To greater or less extent, grazing was regarded as a transitional phase of land use which would lead to more intensive development, and this attitude minimized the apparent need for range care.

The rapid increase of cattle is indicated by the following table showing, by decades from 1870 to 1935, the number on the range portion of six Great Plains States having significant range area, and also the number fed on harvested crops, concentrates, and irrigated pastures as the range progressively became overstocked:

Table 2.—*Cattle on range portion of six Plains States* [1]

[In thousands of animal units]

	1870	1880	1890	1900	1910	1920	1930	1935
On range	1, 390	2, 807	6, 758	8, 504	7, 630	9, 541	9, 293	7, 260
On feed	45	130	375	792	1, 521	2, 541	2, 414	2, 935

The present stocking of the range portion of six Plains States has been estimated by the Forest Service to be close to 100 percent in excess of its estimated grazing capacity under any system which would provide adequate feed and still maintain the vegetation. The detailed figures are of interest: Federal lands, 35.6 percent in excess; Indian lands, 46.1 percent; State, county, and municipal lands, 126.5 percent; private lands, 93.6 percent.[2]

"Stockmen primarily concerned with making ends meet or in making a profit, to which they are justly entitled, generally believe, even in the face of periodic financial difficulties, that the greatest financial return results from grazing the maximum number of livestock on the range. * * * Loans usually have been negotiated on livestock numbers almost regardless of costs, ability of the range to support the number grazed, or net production. In some instances, loaning agencies have unwittingly encouraged overstocking when prices have declined by requesting stockmen to retain young, salable breeding stock in order to reduce the per head value of the loan. By so doing they have overstocked and often undermined the range forage resource which, in the last analysis, supports the loan." [3]

Reduction of expenses of upkeep, stocking on the basis of better years, and building up herds too soon after drought, have contributed further to the problem of range depletion.

[1] *The Western Range.* Letter from the Secretary of Agriculture to the President of the Senate, 1936; S. Doc. 199, 74th Cong., 2d sess., p. 155. [2] *The Western Range*, p. 164. [3] *The Western Range*, p. 168.

Expansion of Arable Farming into Unsuitable Areas.—Generally, the region west of the 20-inch rainfall line is one of high crop hazard, and it contains many areas where cash crop production under dry-farming methods has little chance of continued success. It is not true, of course, that all areas with less than this amount of rainfall are unsuitable for crop farming; where they have good soils, low evaporation and favorable distribution of rainfall in the growing season, or where irrigation is practicable good yields may be obtained. Also there is notable opinion that with suitable holdings, proper variation and proportioning of crops, and sound planning for each crop year in terms of the current moisture conditions, a considerable proportion of the area can be utilized for arable farming.[4] However, such farming has been heretofore too extensive and misguided. In 1934 crop land in the Plains area of Montana, Wyoming, Colorado, and New Mexico amounted to 19,558,000 acres, of which 7,149,000 acres were harvested, 5,299,000 acres were idle or fallowed, and the remaining 7,110,000 acres represented total failure. In the 25-year record of a county in southwestern Kansas there were four complete failures of wheat, four annual yields below 5 bushels per acre, eleven yields of 10 bushels or above, and four of 15 bushels or more. The average yield for the 25-year period was only 8.6 bushels per acre.

Notwithstanding such experience, it is in the region west of the 20-inch rainfall line that the great increase in crop acreage has occurred during the past 30 years.

Maladjustments of Water Utilization to Land Use Requirements.—Land use and water use are joint problems; adequate planning for one must inevitably include planning for the other. The growth of water use in the Great Plains, however, has not always been attended by land use designed to develop the interrelation of both resources to their mutual advantage. There have, for instance, been many situations in which water has been used by those first to appropriate it, in such manner and in such quantities as they have seen fit, frequently to the disadvantage of other and better lands upon which it might have been used, and even of the land upon which it has been used.

With respect to run-off water too little has been done, even where conditions are favorable, to store it in the soil by such practical measures as contour furrowing, listing, and diversion.

Under these circumstances, combinations of land and water use have arisen which now are recognized as serious maladjustments. They have been permitted to continue largely because of the great value placed on water and the consequent disinclination of early appropriators to relinquish advantages already gained. The principal misuses of water in this Region—generally a failure to coordinate various water uses, and to coordinate water and other resources—may be enumerated as follows:

1. Failure to store more of the water in the soil;
2. Use of high-cost water on areas of low productivity for the production of cash crops;
3. Unbalanced withdrawals from a stream basin resulting in inequitable distribution of the water supplies of the basin;
4. Poor physical distribution of water supplies;
5. Improper financing of water-development works;
6. Unbalanced withdrawals and depletion of ground-water supplies.

Poorly Balanced Systems of Farming.—Undue dependence is placed on one crop—wheat—in the agriculture of the Great Plains. Of the 44,844,000 acres of crops harvested in the Great Plains in 1934, 17,616,000 acres were in that crop. In some sections the proportion was even higher; for instance, over 6,000,000 of the 8,000,000 acres of harvested crop land in the Plains counties in Kansas in that year were in wheat. Even in the face of recent experience the 1936 planting of wheat throughout the Great Plains area is the largest on record.

[4] See Ch. I, p. 32.

Where income in the Great Plains depends wholly on cash crops, one-crop farming seems not only necessary but also logical to the farmer. Undependable as is wheat in the drier portions of that area, he has a better chance of producing a salable product from it than from almost any other crop. It is, furthermore, a very economical crop to produce; it is better adapted than any other crop to machine methods and can be planted and harvested on greater acreages by one operator. But when there is a failure of wheat, which is all too frequent, the Plains farmer is left with no income whatsoever, while his fixed costs remain substantially the same.

Undesirable Tendencies in Land Tenure

The present pattern of ownership and use is a result of the original homestead system and its concomitant, land speculation. Absentee ownership, the development of land in uneconomic units, and excessive tenancy are all characteristics of the Region. The early homestead system, which provided for parcelling out the land in 160-acre tracts, was well adapted to the humid sections of the country, but it was unsuitable in the subhumid and semiarid Plains. Even when the homestead was increased to 320 acres in 1909, and again in 1916, to 640 acres for pasture use only, it was still much too small, in most cases, for proper utilization of the land resources. But most of the damage had been done prior to the passage of these later acts.

Speculation raised the price of land far above its earning value, and this tendency was intensified by the credit system. Consequently, a large percentage of land has fallen into the hands of lending agencies, and a large proportion of farms has changed ownership through tax sales, mortgage foreclosures, and bankruptcies. Even in 1935, when extensive Federal credit aid was available, a significant proportion of the farms changed ownership through forced sales. Much land has been lost, largely because the owners have not been able during the depression and drought to meet the large annual payments based on a speculative value of the land.[5]

Absentee Ownership.—Many land-use problems which need adjustment in the Great Plains result from the fact that a large proportion of the land is owned by many different types of owners, and is not subject to direct control by individual operators in units large enough to fit their needs. Although complete data are not available for all States in the area, it is apparent that the class of individual owner-operators owns a proportion surprisingly small, in view of the recentness of settlement under the Homestead Acts, of the land in most, if not all, of the States. For instance, approximately 43 percent of the land in Montana is owned by public agencies, 14 percent by corporations, primarily credit agencies; and only 41 percent—38,616,000 acres—by individuals. Of the 38,616,000 acres owned by individuals, approximately 10,000,000 acres are owned by persons who are not residents of Montana, and 5,000,000 acres by residents of Montana who do not operate the land they own. The land held by corporations, plus the land owned by nonresidents of Montana, is almost as great as the acreage owned by individual Montana residents. Absentee ownership is characteristic of other areas throughout the Region. In most of the States of the Great Plains area, the Federal and the State government are important landowners, and it is clear from data respecting ownership in selected counties in the southern portion of the Region that the nonresident individual owner is also likely to be found to be generally a prominent landholder. The nonresident landowner, who in many instances holds land for purely speculative reasons, is defined as an individual who does not operate or reside on the land which he owns, although he may reside in the county or State. In many areas the actual operator may be relatively unimportant as a landowner.

Uneconomic Operating Units.—Of even greater significance is the fact that most of the ownership

[5] The consequences of improper land use are developed more fully in Chapter IV.

tracts are small and scattered, so that it is exceedingly difficult for an operator to gain control over an efficiently organized unit. Under prevailing practices, most of the land in the Great Plains has to be used in relatively large units, as compared with other sections of the country, rather than in small units. In certain localities, on the other hand, some farmers have undertaken to cultivate more land than they are prepared to handle effectively. This is the situation, for example, in parts of the southern Plains.

For an individual to have a stock ranch which is an economically sound unit, it may be necessary for him to control from 8,000 to 15,000 acres. Even in the more humid areas which are adapted in greater or less degree to grain production, it is usually advisable to allow land to lie fallow every other year, and for this reason an individual's land requirements are approximately twice as large as his acreage in grain during any one year, even if he attempts no combination of grain and livestock farming.

An illustration of the way in which much of the land in the Great Plains is held in small scattered ownership tracts is given in Figure 17 for a county in South Dakota. In order that an individual operator may secure an area of land which will support a reasonable standard of living for his family in good years, and keep them off relief rolls in drought years, it may be necessary for him to lease land from two or three nonresidents and from one or two public agencies. It is noticeable in Figure 17 that the lands owned by the county and the Federal government are held for the most part in small units interspersed among the holdings of both resident and nonresident individual owners.

Extensive Tenancy.—Although not peculiar to the Great Plains, farm tenancy is a major problem in that Region. It has increased steadily. As early as 1880, while the homestead movement was at its height, 15.5 percent of the farmers in eight typical Plains States were of tenant status.[6] By 1900 the number of farmers had about doubled, but the number of tenants had tripled. In 1935, tenants constituted 41.1 percent of all farmers in the eight typical States. The highest percentage of farms operated by tenants is found in Nebraska (49.3 percent) and the lowest in New Mexico (19.0 percent). The increase in Montana and the two Dakotas has been marked during recent years of frequent drought. Including that held by farmers who own part and rent part of the land they operate, the land under lease had in 1935 reached the startling proportion of 51 percent of all the land in farms, varying from 40 percent in Wyoming to 62 percent in South Dakota.

The outstanding evils of extensive tenancy are: (1) its influence in determining the prevailing type of crops and farm practice, tenants being more likely to engage in grain farming than in stock raising (40.3 percent of tenant farms as contrasted with 22.0 percent of full-owner farms being devoted to cash-grain crops); (2) the consequent influence in increasing the degree to which, under the climatic conditions, the land generally is subject to abuse; (3) the influence on each tenant to "mine" his land and on the owner to consent thereto; and (4) instability and insecurity of tenure, which intensifies the other evils.

Instability and Insecurity of Tenure.—Instability and insecurity are not limited to tenant operators, but both are much more common among tenants than among owners. In the winter of 1935 approximately 40 percent of the tenant farmers in the Great Plains States (excluding Oklahoma and Texas) had been occupying their farms for one year or less, while fewer than 10 percent of the owner operators were in a similar position. In several of the States less than 10

[6] Tenants are here considered to be those who rent all the land they operate. Data concerning Oklahoma and Texas are not included, because the situation in those States is strongly influenced by conditions in cotton-growing areas outside the Great Plains.

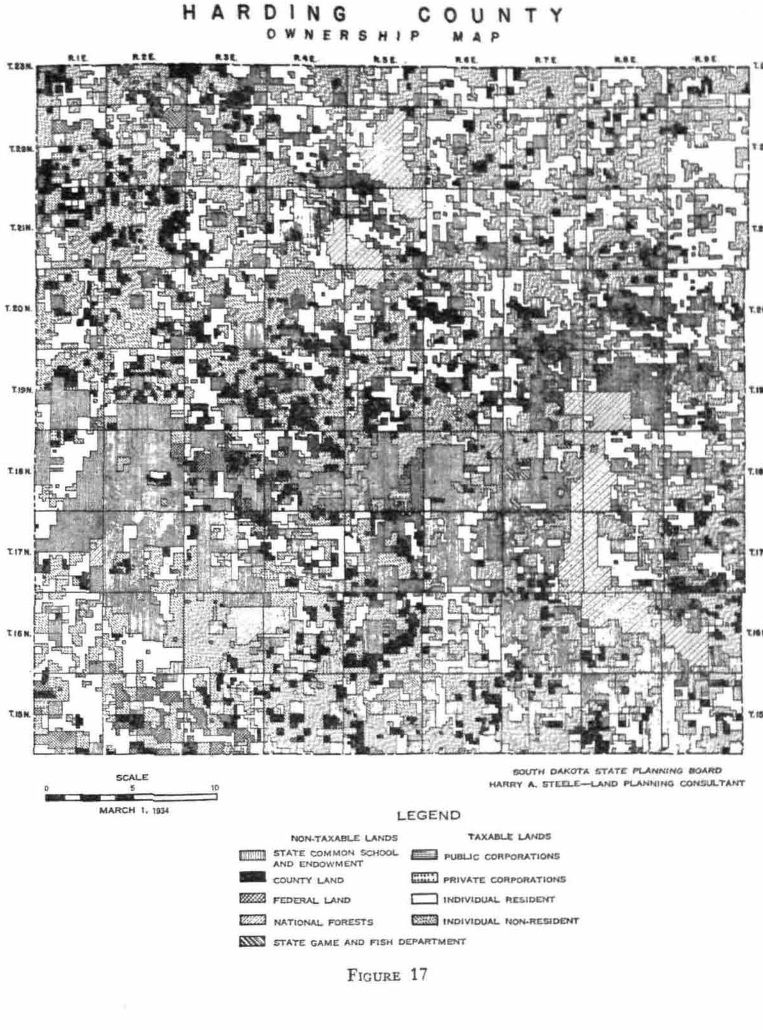

HARDING COUNTY
OWNERSHIP MAP
SCALE
0 5 10
MARCH 1, 1934
SOUTH DAKOTA STATE PLANNING BOARD
HARRY A. STEELE—LAND PLANNING CONSULTANT
LEGEND
NON-TAXABLE LANDS
STATE COMMON SCHOOL AND ENDOWMENT
COUNTY LAND
FEDERAL LAND
NATIONAL FORESTS
STATE GAME AND FISH DEPARTMENT
TAXABLE LANDS
PUBLIC CORPORATIONS
PRIVATE CORPORATIONS
INDIVIDUAL RESIDENT
INDIVIDUAL NON-RESIDENT

FIGURE 17

percent of the tenant farmers had occupied their farms for ten years or more, and in no State had 25 percent of the tenant farmers experienced that degree of stability of occupancy. Such insecurity and instability are reflected in constant migration within the Region.

The major unfavorable consequences of such instability, and the concomitant leasing system, are: (1) The tenant must plan his operations on a year-to-year basis and cannot develop a sound and efficient farming program, which is a potent factor in making for exploitation rather than conservation of soils; and (2) he is not stimulated to take an interest in community life, which retards development both of community organization, services, and activities, and of the higher values of family life.

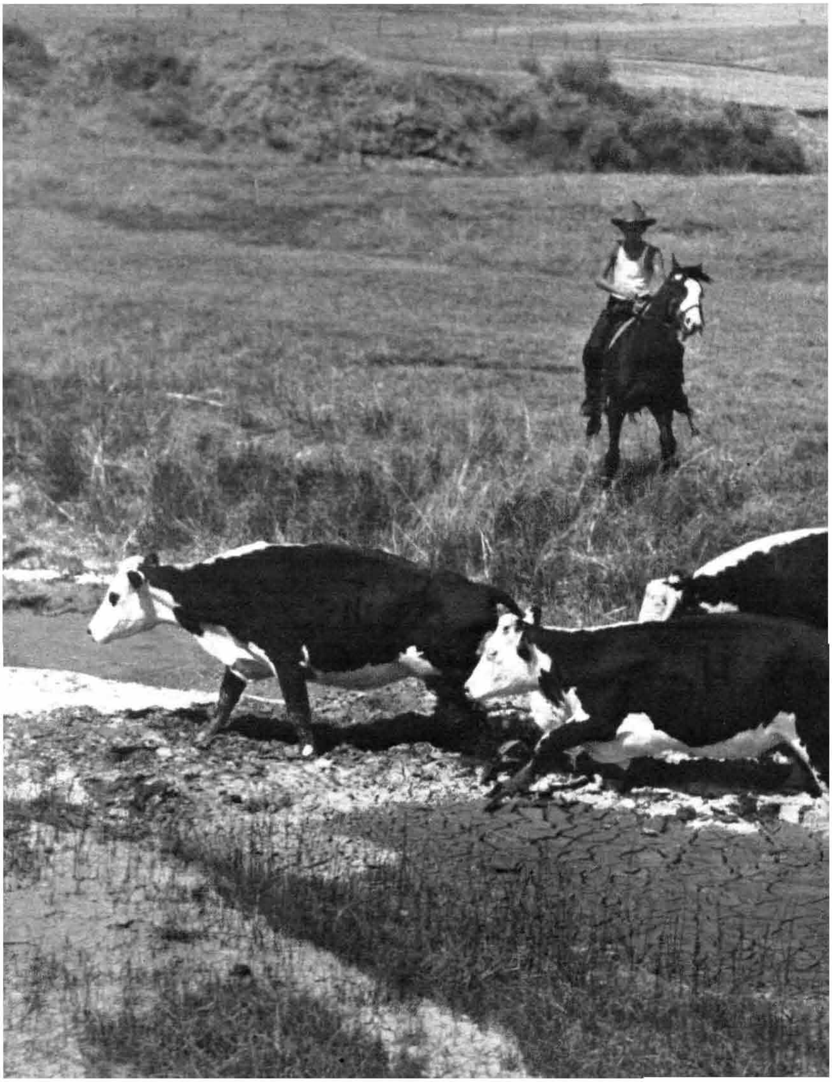
The Leasing System.—The crop-share method of leasing land, typical in a large part of the eastern section of the Region, has done much to prevent proper use of the land. The absentee landlord finds the crop-share lease expedient since by it he is assured a cash income every year in which a crop is harvested, and he feels that he is more likely to keep track of and collect his share of the rent when a single cash grain crop is grown. Accordingly, he demands a lease which practically prohibits the tenant from engaging in livestock farming, or even in a diversified type of crop production.

In the cattle-grazing areas of the Region much of the land is rented for cash on a per-acre or per-head basis, and the leasing agreement does not specify the number of cattle or sheep which may be grazed on a given acreage. The immediate interest of the renter—abetted by the short-sighted consent of the owner—frequently causes him to graze more cattle or more sheep than the carrying capacity of the land can maintain permanently.

Another important factor retarding the proper agricultural development of the Great Plains is the handicap under which a tenant works with reference to improvements on the leased farm. The landlord in numerous instances has not seen fit to supply the tenant with adequate facilities, such as barns, sheds, granaries, fences, wells, reservoirs, and water holes, and the usual leasing agreement does not make it possible for the tenant to provide them except at his own expense. For the tenant to provide them at his own expense is impracticable because he may have to leave the farm long before he has used the improvements long enough to reimburse himself for making them.

Difficulties are aggravated by the verbal leasing agreements common in the Great Plains. Too often oral leases are agreed to hastily and do not contain all essential details concerning the organization and management of the farm and the responsibility of each party. This often makes it necessary that new arrangements be made currently during the year, which is frequently a cause of petty—and occasionally of major—irritations.

Altogether, the non-business-like nature of the system of tenure and occupancy and of the related type of leasing destroy rather than inspire interest in conservation of soil and water resources and in the development of economically secure and socially stable rural communities.



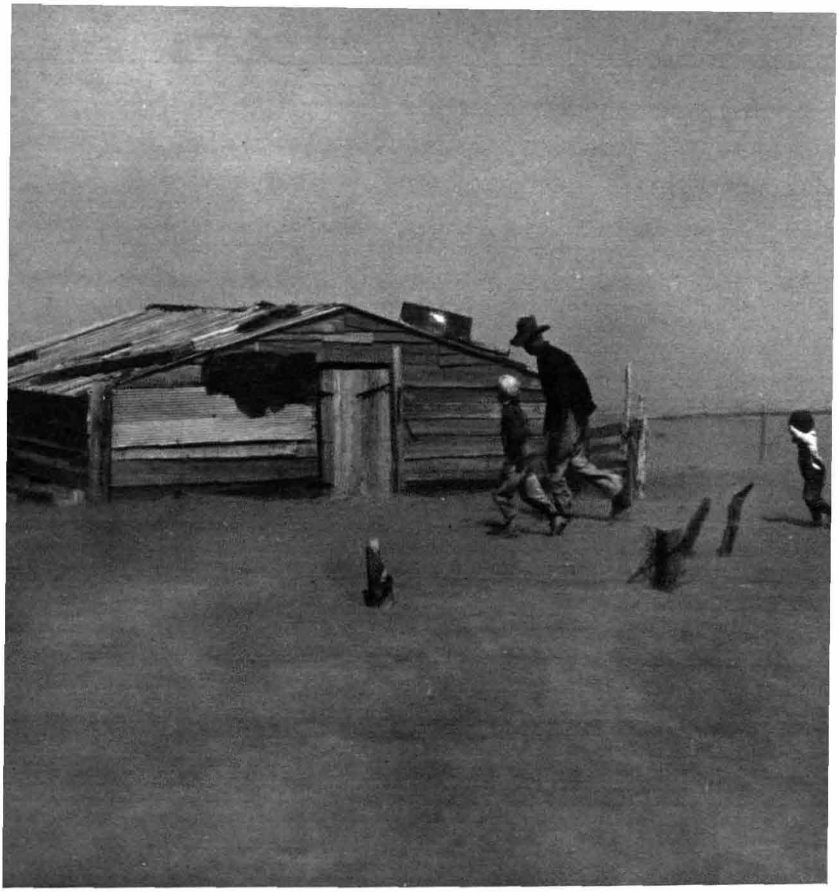


FIGURE 19.—*Running for shelter from a dust storm.* (Resettlement Administration photo.)

FIGURE 18 (preceding page).—*Rounding up cattle to be sold for want of water.* (Resettlement Administration photo.)

Chapter IV

DESTRUCTIVE EFFECTS OF UNDESIRABLE TENDENCIES

Most spectacular of the destructive effects in the Great Plains of the cultivation of unsuitable lands, and of suitable lands by improper methods, have been the unprecedented dust storms of recent years. These storms have ruined or impaired the productivity of thousands of acres of land, made life almost unbearable at times, destroyed livestock, and caused sickness and even death among human beings.

SOIL WASTAGE

Except along the eastern margins, wind erosion is a more or less serious problem throughout the Region. Dust clouds always have developed there in exceptionally dry years, on cultivated and overgrazed areas. The greater extent and intensity of wind erosion and of resultant dust storms in recent years have resulted in large part from exposure of more soil to the direct action of the wind. Overgrazing, the tremendous expansion of tilled acreage, the reduction of the organic matter in the soil, and a succession of years of low rainfall are the chief factors that have made possible the recent great increase in soil impairment and destruction. In many places the top soil has been stripped from good land, and in others sand dunes 15 to 20 feet high have formed. The rapid increase in size of the affected areas, and the gradual exhaustion of the grass roots and soil-binding humus under conditions of cultivation are among the factors that justify serious concern.

Damage by wind erosion cannot be measured precisely. Twenty counties, with approximately 25,000 square miles, lying in a compact area in the Southern Plains where four States touch the northwest corner of Texas, have been surveyed in considerable detail by the Soil Conservation Service. About 80 percent of this area is affected more or less by wind erosion and about 40 percent of it to a serious degree. Although there sheet erosion and gully erosion are not so dramatic as wind erosion, sheet erosion nevertheless does constitute a problem in many localities. Where wind erosion occurs in dry seasons, sheet erosion may be a destructive force in wet seasons. The harmful effect of water erosion is felt over about 15 percent of the area.[1]

DEPLETION OF THE RANGE

As a result of overstocking through many years, the range lands of the Great Plains have been seriously depleted. The best available information indicates that for the past quarter-century about 75 percent of the whole range has declined in forage value. This downward trend will continue unless more care is given the range than in the past. Positive efforts in readjustment of range use are needed to stop this downward trend and start the process of restoration.

"A large proportion of the short grasses in the original plant cover of these Plains has been replaced by weeds and shrubs of low palatability . . . Accompanying this decrease in forage quality is the even more serious decrease in volume of forage through thinning of the entire plant cover. The vegetation in general is only

[1] See Appendix 3.

half as thick as it was when the white man first began to use the range for pasturage. The recent drought is responsible for a certain amount of the thinning. It is worth noting, however, that small remnants of the short-grass range protected from grazing have nearly 10 times as thick a plant cover as adjacent areas exposed to the same drought conditions but long overgrazed by livestock.

"As a result of this loss in quality and decrease in volume of vegetation, the forage value of the short-grass range is much less than that of the virgin range, and that this condition is widespread is indicated by the following figures from an extensive survey made in 1935:

Decline from original forage value:	*Percent*
Southwestern North Dakota	25–50
Northwestern and western South Dakota	37–43
Northeastern Colorado, western Nebraska, and southeastern Wyoming	50–60
Southwest Nebraska and northwestern Kansas	50–75
Western Texas	50–70

"Forage in southeastern Colorado, the 'dust bowl' area, has lost 88 percent of its former value. The forage of about 13 percent of the entire short-grass area has been extremely depleted, more than three-fourths materially or severely depleted, and only about 8 percent can be classed as being in reasonably good condition . . . The short-grass type, however, has remarkable recuperative powers. With favorable weather conditions and adequate care, it recovers quickly." [2]

Water Wastage

The maladjustments of water utilization to land use outlined in the preceding chapter have had harmful consequences.

Lack of Coordination of Water Uses and of Water With Land Resources.—In few places have studies been made of preferences in the use of water, or of the possibilities and conditions of multiple use. For example, in some instances the use of water for generating power during the nonirrigation season involves a loss of water which otherwise could be stored for use in irrigation. In other instances, water is used for the production of cash crops to be shipped from a given area, while adjacent range resources cannot be used adequately in all years because of lack of supplemental forage for livestock feed.

Use of High Cost Water for Cash Crop Production on Lands of Low Productivity.—In many places water is used on poor land at the expense of more productive land that might be served. Such misuse of resources may lower the productivity of an entire irrigation district and may result in the inability of the enterprise providing water to maintain its system properly. Standards of living may be depressed on both the well watered poor land and the inadequately watered good land. Wastage of water even on productive soils may result from the fact that in many stream basins its most efficient use is determined by climate and the length of the growing season, both of which may be unfavorable. It is therefore obvious that use of water for the irrigation of cash crops on inferior soils or under unpropitious climatic conditions may involve not only a waste of water, but also a waste of human effort. In such instances the adjustment of water use to fit other critical conditions would permit a better usage of all resources and increased returns for the efforts expended.

Unbalanced Appropriation Resulting in Inequitable Distribution of Water Within a Stream Basin.—In some instances lands which are inadequately supplied with water during part of the growing season receive a surplus of water during other periods of the year. Efforts to build up soil moisture by artificial application of water during the periods of surplus supply often result in waste of water, increase of alkali in the soil, and an impairment of soil productivity. Occasional failures of crops in areas having inadequate or unseasonable supplies of water have led, in some instances, to the adoption of ineffective expedients, to defaults in financial obligations incurred in the construction of the irrigation works, and

[2] *The Western Range.* Pp. 88–90.

to long litigation. Sometimes drainage problems resulting from unbalanced water appropriations require additional drainage works which add to the financial burden of the areas.

Poorly Designed Irrigation Systems.—Storage reservoirs may be shallow, and thus contribute to high evaporation losses; silting may be heavy; some diversion works may be inadequate to secure water during periods of low run-off, and conversely other diversion works, canals, and ditches may not be capable of diverting or carrying the available supply during periods of high water. When the water rights of poor systems are senior to those of good systems, a loss of aggregate benefits to the users along the stream invariably results. The financial loss from such factors has been severe in many instances.

Improper Financing of Irrigation Works.—Burdening of irrigated land with heavy investment costs which were presumably to be met within relatively short periods, or deterioration of irrigation systems because of inadequate maintenance funds, one or both, have resulted in many foreclosures and even in the abandonment of the lands involved. The financial loss sustained by both settlers and investors has been severe. In other instances, wastage of water through transportation to scattered areas has resulted in bad financial conditions throughout an entire community. In most areas the owners of the lands to be irrigated have borne the entire cost of construction, although many benefits have accrued to others.[3] The spreading of costs to all beneficiaries, both direct and indirect, in proportion to the benefits received—for instance, to include the urban market center of an irrigation district—would have transformed many unsuccessful projects into successful enterprises.

Depletion of Ground-Water Supplies.—There has been excessive withdrawal of ground water from certain areas, notably in the eastern half of North Dakota and South Dakota, and in the Roswell artesian basin in eastern New Mexico, where in consequence thousands of acres, formerly highly productive, have reverted to native vegetation. There are few areas in which the recharge of ground waters is sufficiently rapid to warrant large-scale development of irrigated land dependent on them. Where the rate of withdrawal from the underground reservoir is greater than the rate at which recharge takes place, the falling water table causes the lift and cost of pumping to mount constantly. Soon or later, a point must be reached where it is no longer economically feasible to recover the ground water for the use to which it had been applied. The industries and communities built around this decreasing and receding resource must then either undergo readjustments or disappear. Natural recharge of an underground water reservoir in the Great Plains is a slow process. The development of an economy around an exhaustible but renewable resource should take into account the effect of withdrawal from that resource, and should be adjusted to a permanent yield basis.

INADEQUATE AND EXCESSIVELY VARIABLE INCOME

Attempts in some portions of the Great Plains to establish a type of land use based on climatic conditions which prevail in only a few relatively favorable years, naturally has resulted in highly variable and frequently inadequate income. Data concerning farm incomes in the Region are not adequate for definite conclusions on the previous standards of living in the area, and on recent changes in these standards as a result of protracted drought. The only available farm income data for the counties in the area (rather than for entire States) are those of gross income [4] from the 1930 Agricultural Census; and these relate to 1929 when there was no widespread drought and the prices of farm products were relatively high. In most of the Region only a comparatively small proportion of the farmers in that year received gross incomes of less than $1,000. These gross income figures, however,

[3] See Appendix 4. [4] Gross income from farm production includes the value of farm products consumed on the farm.

take no account of cash production expenditures, which probably were higher than in many sections of the United States.

An indication of the relative standard of living in 1930 in the States of the Great Plains is given by the data in Table 3. It should be kept in mind that these are State-wide averages and therefore include the eastern, more humid and more prosperous portions of several of these States.

It is well known that since 1929 earned incomes in the Great Plains have been far below the level of that year. The depression and a concurrent succession of drought years have impaired the economy of the Region seriously. Distress has been widespread, and the people of the Plains States necessarily have been the recipients of extensive direct and credit relief which will be considered more fully in following sections. Some light is thrown on the trend of incomes in the States of the Great Plains in recent years by the data presented in Table 4. These data should be interpreted with caution because they also cover entire States; are estimates based on the income from 78 crop and 13 livestock items; include Government purchases and slaughter payments; represent gross rather than net income and thus take no account of heavy fixed charges; and generally are only roughly indicative of effective net income. However, they do show a trend, and particularly the decline in income from the year 1929.

Fully as serious as recent low average net incomes are the uncertainty and extreme variability of income from year to year. It has been calculated that on a 640-acre wheat farm in Sheridan County, western Kansas, where more than 80 percent of the income is derived from cash grain, the average annual net income between 1912 and 1934 was $1,008. But of the total net income of $21,167, the bumper crop of 1920, which sold at an exceptionally high price, accounted in the calculations for $20,472. Excluding that year, the total net

TABLE 3.—*Indices of standard of living of farm families* [1]

State	Value of farm products consumed	Value of farm dwellings	Farms lighted by electricity	Farms having water piped into dwellings	Homes having telephones	Homes having radios	Farm operators having autos	Illiteracy of native-born whites of native parentage
	Dollars	*Dollars*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
North Dakota	320	1,051	7.9	7.5	40.9	39.5	86.6	.3
South Dakota	291	1,520	10.9	14.5	53.6	44.5	86.5	.2
Wyoming	283	1,045	7.2	12.5	28.0	49.3	71.6	.3
Montana	249	959	7.5	11.3	20.4	38.5	72.6	.3
Nebraska	328	1,806	16.5	29.6	72.5	10.9	91.8	.3
Kansas	267	1,354	12.5	16.9	72.8	7.7	76.5	.4
Colorado	210	1,167	15.7	20.5	39.8	32.8	76.0	1.1
Oklahoma	243	673	4.0	5.3	26.1	29.0	57.7	2.7
Texas	208	791	4.6	13.9	19.6	29.4	56.7	2.0
New Mexico	190	595	5.4	8.9	9.2	6.4	44.9	8.3
Average for 10 States	249	1,062	7.9	14.2	36.8	22.5	69.2	1.3
Average for United States	250	1,207	13.4	15.8	34.0	20.8	58.0	1.8
Average for highest ranking geographical division	[2] 312	[3] 2,338	[4] 52.9	[5] 59.7	[6] 58.0	[7] 44.6	[8] 79.7	[9] .3

[1] 1930 Census data. [2] New England. [3] Middle Atlantic. [4] Pacific. [5] Pacfiic. [6] East North Central. [7] New England. [8] East North Central. [9] Pacific.

FIGURE 20.—"*The Black Blizzard*"; *the dust storm of April 14, 1935, near Lamar, Colorado.*
(Photo by J. H. Ward, Lamar, Colorado.)

FIGURE 21.—*Drift from dust storms in Oklahoma.* (Resettlement Administration photo.)

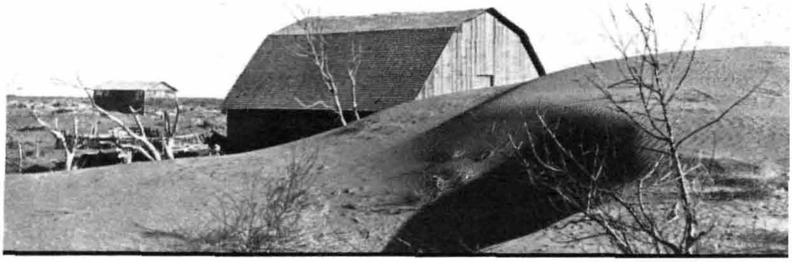


FIGURE 22.—*Drift threatening to engulf a barn.* (Resettlement Administration photo.)

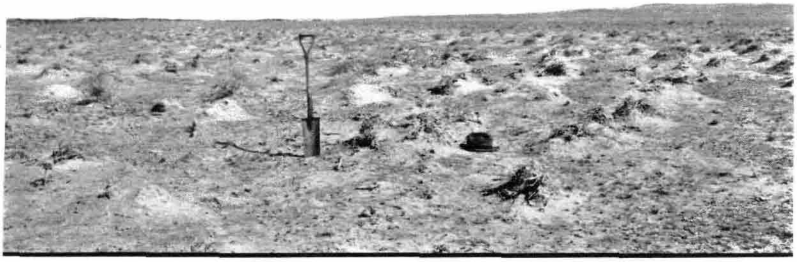


FIGURE 23.—*Continued overgrazing has killed even the sagebrush on this Wyoming range.* (Soil Conservation Service photo.)

FIGURE 24.—*Overgrazed and wind-blown Nebraska sand hills; original grass level at tops of hummocks.* (Soil Conservation Service photo.)

income for the period would have been only $695, or less than $35 a year for the labor of an entire farm family.[5] This is an extreme and dramatic illustration of circumstances resulting from climatic and other physical conditions in the area and largely independent of general business conditions. Obviously no farmer can manage his financial affairs effectively under such circumstances.

TABLE 4.—*Average gross income from farm production, including AAA slaughter payments and Government purchases, per farm in States of the Great Plains Region* [1]

State	1929	1933	1934	1935
North Dakota	$2, 775	$1, 116	$804	$1, 147
South Dakota	2, 850	905	839	1, 210
Nebraska	3, 537	1, 399	1, 528	1, 676
Kansas	2, 632	988	1, 166	1, 398
Oklahoma	1, 498	754	611	876
Texas	1, 527	890	881	982
Montana	2, 807	1, 188	1, 539	1, 986
Wyoming	3, 791	1, 700	2, 124	2, 435
Colorado	2, 868	1, 171	1, 243	1, 532
New Mexico	2, 064	781	966	944
U. S. average	1, 905	926	980	1, 176

[1] Sections of these States not within the Great Plains area are included.

ABNORMAL INDEBTEDNESS AND DEBT SERVICE

Low and variable incomes are complicated by mortgage indebtedness as a cause of financial distress in the Great Plains. The volume of indebtedness and the proportion of land mortgaged rose rapidly almost from the beginning of settlement in the Region. This tendency grew inevitably from the conditions surrounding the development of the Plains. Land was bought largely on credit. The extensive speculation in land, to which reference has been made, naturally encouraged this practice as did also the instability of settlers. Constantly in search of better land that would yield greater profits, they moved about, purchased land, and incurred indebtedness freely.

The years of high agricultural prices and the contingent profits made it seem logical to the farmers to acquire control of as much land as possible, even at increasing prices, despite the costs involved in heavy borrowing. High prices brought another evil in their train: overvaluation of the land itself. A further factor leading to the growth of mortgage indebtedness was the purchase of tractors, combines and other power machinery on credit. The effect of this on land utilization has been noted already; its further result was to saddle the farmers with a burden of debt which is a form of maladjustment to basic conditions.

[5] Thornthwaite, p. 233.

Table 5 shows the estimated farm mortgage debt in the ten Great Plains States by decades from 1910 to 1930 inclusive, and for 1925 and 1935. It should be noted here—a subject considered more fully below—that the decrease in mortgage debt between 1930 and 1935 reflects wholesale liquidation through foreclosures and voluntary deeding of farms to creditors.

LIQUIDATION AND REFUNDING

The widespread tendency to seize what appeared to be an immediate advantage in disregard of long-run probabilities inevitably bore bitter fruit. After the conclusion of the World War, agricultural prices and then land values collapsed. Many banks had loaded their portfolios with papers secured by land at greatly inflated valuations, a wave of bank failures in the States of the Great Plains accompanied and followed the reduction in land values, and renewal of mortgages became impossible.

TABLE 5.—*Estimated farm mortgage debt in selected States, January 1, 1910, 1920, 1925, 1930, and 1935*

A. Thousands of Dollars

State	1910 [1]	1920 [1]	1925 [1]	1930 [1]	1935 [2]
North Dakota	101, 450	267, 780	226, 714	204, 598	146, 910
South Dakota	88, 700	278, 880	372, 004	295, 725	184, 579
Montana	19, 620	154, 940	116, 616	129, 200	74, 407
Nebraska	161, 850	416, 860	617, 930	560, 973	486, 160
Wyoming	7, 820	32, 970	43, 364	42, 948	32, 431
Kansas	163, 770	295, 870	482, 596	487, 122	390, 434
Colorado	41, 800	138, 400	153, 727	146, 462	97, 308
Oklahoma	77, 680	188, 890	218, 963	214, 033	163, 463
Texas	172, 240	396, 670	485, 587	543, 951	538, 812
New Mexico	4, 810	23, 670	28, 784	30, 729	30, 498
Total, 10 States	839,740	2,194,930	2,746,285	2,655,741	2, 145, 002
United States	3,320,470	7,857,700	9,360,620	9,241,390	7, 770, 000

[1] U. S. Department of Agriculture, Yearbook of Agriculture, 1935, p. 693. [2] Estimate by Farm Credit Administration.

TABLE 5.—*Estimated farm mortgage debt in selected States January 1, 1910, 1920, 1925, 1930, and 1935*—Continued

B. Index Numbers

(1910=100 for each State)

State	*1910*	*1920*	*1925*	*1930*	*1935*
North Dakota	100	264	224	202	145
South Dakota	100	314	419	333	208
Montana	100	790	594	658	379
Nebraska	100	258	382	347	300
Wyoming	100	422	554	549	415
Kansas	100	181	295	297	238
Colorado	100	331	368	350	233
Oklahoma	100	243	282	276	210
Texas	100	230	282	316	313
New Mexico	100	492	598	639	634
Average, 10 States	100	261	327	316	255
United States	100	237	282	278	234

The recent years of depression, of declining farm prices, and of crop failures because of drought, have increased the burden of the mortgage debt which the farmer bears. Farm cash income, on the average never high, practically vanished for many farmers, and they became unable to meet debt service charges and payments on principal as they fell due. The result was widespread financial distress and a rapid increase in the number of foreclosures. It should be noted that the figures in Table 6 are per *thousand* and not per *hundred*. Neighbors rallied around farmers who were being sold out, not infrequently forcing the abandonment of the sheriffs' sales. In some States legislative reprieves were extended to debt-harassed farmers in the form of moratoria on defaulted mortgages. Even earlier some State governments—notably South Dakota—had been called upon to extend loans directly to farmers to relieve credit stringency only to endanger the foundations of their own credit in subsequent years. Finally, the Federal Government came directly to the agriculturist's aid in the Federal Farm Mortgage Act. Under the terms of this measure, mortgages held by private creditors could be exchanged for Government guaranteed bonds, the Government taking over the mortgage. Rates of interest were scaled down and properties revalued.

Between May 1933 and July 1934 there was an active demand for this type of Government credit in the Great Plains States (Figure 25). Complete data are not available on the amount of private mortgage credit outstanding in the Region, but Federal Land Banks and the Land

TABLE 6.—*Number of foreclosure sales and related defaults per 1,000 farms in the United States and selected States*

[Includes loss of title by default of contract, sales to avoid foreclosure and surrender of title or other transfers to avoid foreclosure]

State	Twelve months ending March 15										
	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936
North Dakota	46. 3	43. 0	39. 4	32. 0	30. 1	34. 1	54. 0	63. 3	31. 3	18. 9	25. 5
South Dakota	52. 5	51. 1	46. 8	27. 2	27. 1	33. 2	49. 2	78. 0	64. 2	62. 4	63. 4
Montana	60. 8	56. 0	40. 9	21. 1	25. 1	31. 1	34. 6	39. 8	30. 1	21. 8	23. 1
Nebraska	21. 9	25. 3	34. 9	15. 7	15. 9	21. 8	34. 4	58. 2	45. 8	41. 0	41. 0
Wyoming	27. 9	25. 6	19. 3	17. 8	17. 3	20. 1	26. 3	23. 2	24. 0	23. 4	19. 4
Kansas	15. 8	16. 0	19. 4	13. 0	14. 8	20. 0	36. 0	52. 7	48. 0	40. 7	33. 9
Colorado	43. 3	36. 3	26. 1	21. 6	18. 8	20. 3	27. 5	45. 2	40. 6	31. 7	32. 6
Oklahoma	24. 1	24. 2	21. 8	14. 3	18. 2	22. 4	30. 5	44. 7	23. 7	16. 4	18. 0
Texas	9. 3	10. 5	9. 5	8. 5	9. 6	12. 8	23. 6	30. 5	19. 6	16. 9	16. 3
New Mexico	53. 7	30. 3	20. 6	12. 4	12. 4	22. 3	20. 1	26. 4	22. 3	21. 1	20. 7
Average, 10 States [1]	23. 7	23. 4	21. 7	15. 2	16. 2	20. 3	32. 1	44. 2	31. 7	26. 3	26. 0
United States	17. 5	18. 0	17. 7	14. 9	15. 7	18. 7	28. 4	38. 9	28. 0	21. 0	20. 3

[1] Weighted average, based on number of farms in each State in 1930, exclusive of croppers.

Bank Commissioner have loaned there more than $600,000,000 since 1933, largely to permit refinancing of other debts. Other forms of credit also have been extended. Between the first authorization of such loans in 1918 and May 31, 1936, the Federal Government disbursed among all farms of the country more than $300,000,000 for feed and seed loans. Although the ten States in the Great Plains Region embrace only about 20 percent of all the farms in the country, farmers there received 40 percent of the whole amount. While only 21 percent of the amount loaned elsewhere remains unpaid, 62 percent of those loans extended in the Great Plains States is still outstanding. Eighty percent of the amount allotted by the Federal Government for special drought relief loans in 1934 and 1935 was accounted for by ten Great Plains States; 88 percent of these loans was still outstanding in May 1936.

Excessive Dependency

Expenditure of Federal money for relieving human distress in the Great Plains reflects economic maladjustments intensified by recurring droughts since 1930. Although large areas west of the Continental Divide were affected by drought in 1933 and 1934, and large areas east of the Mississippi in 1936, in each successive drought the area between the Divide and the Mississippi was stricken most severely. The accumulated amounts of Federal aid expended in that area between April 1933 and June 1936—running as high as $200 per capita of total population in some counties—including Federal Emergency Relief Administration, Civil Works Administration, and Works Progress Administration expenditures, Agricultural Adjustment Administration benefits[6] and cattle purchases, and

[6] Agricultural Adjustment Administration benefit payments were not intended as relief. As in other areas, they were paid for compliance with certain acreage and production control requirements. However, if such payments had not been made, it is probable that relief payments would have been larger in the drought-stricken counties.

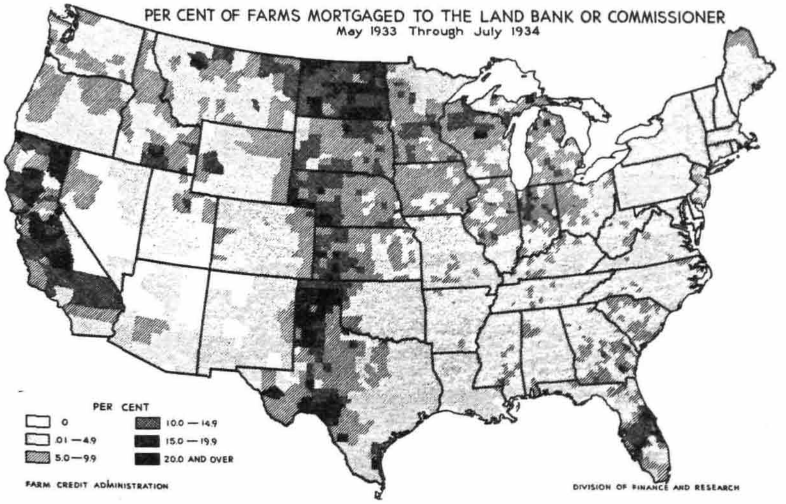


Figure 25

Resettlement Administration grants, measure the degree of this distress [7] (Figure 26).

The total amount of obligations incurred for relief in the counties of the Great Plains under the program of the Federal Emergency Relief Administration and Works Progress Administration is shown by States in Table 7. It should be remembered that it is difficult to segregate the amount of relief necessitated by drought from the amount arising from other causes.

TABLE 7.—*Amount of obligations incurred for emergency relief and works program from Federal funds in the counties of the Great Plains Region, by States*

State	Federal Emergency Relief Administration, April 1933 through April 1936 [1]	Works Progress Administration, April 1935 through June 1936	Total
Colorado	$16, 857, 046	$7, 409, 596	$24, 266, 642
Kansas	11, 130, 477	3, 010, 635	14, 141, 112
Nebraska	6, 540, 849	2, 084, 414	8, 625, 263
Oklahoma	5, 375, 641	2, 043, 981	7, 419, 622
Montana	8, 249, 597	2, 795, 800	11, 045, 397
New Mexico	6, 408, 390	1, 982, 655	8, 391, 045
North Dakota	19, 981, 418	3, 597, 796	23, 579, 214
South Dakota	19, 477, 261	2, 774, 543	22, 251, 804
Wyoming	2, 878, 035	1, 012, 252	3, 890, 287
Texas	9, 053, 329	(2)	....
Total	$105,952,043	$26,711,672	$132,663,715

[1] Includes obligations incurred for relief extended under the general relief and rural rehabilitation programs and for administration; beginning April 1934 these figures also include purchases of materials, supplies, and equipment, rentals of equipment, earnings of nonrelief persons employed and other expenses incident to the emergency work relief program.

Terminal date varies for some States as follows: Colorado, November 1935; Montana, Oklahoma, Nebraska, and Texas, December 1935.

[2] Texas data not available on a county basis.

The first earmarked grants for drought relief were made in September 1933, although some Federal aid had been extended during the preceding summer to farmers suffering from drought conditions. Feed and seed loans had even earlier beginnings. It was not until June 1934, however, that special drought assistance attained major proportions. The Emergency Appropriation Act approved by the President in June 1934 provided $525,000,000 for drought relief purposes through the entire country.

Although drought assistance was extended to more than half of the United States, the major portion of all funds provided for this purpose was spent in a relatively limited area comprised in large part of the Great Plains States. Table 8 shows that portion of the fund granted by the Federal Emergency Relief Administration for relief and the processing of cattle, and does not include various items such as land purchase and the disposition of surplus cattle.

TABLE 8.—*Federal Emergency Relief Administration grants to States in the Great Plains Region earmarked for drought relief, and care and processing of cattle* [1]

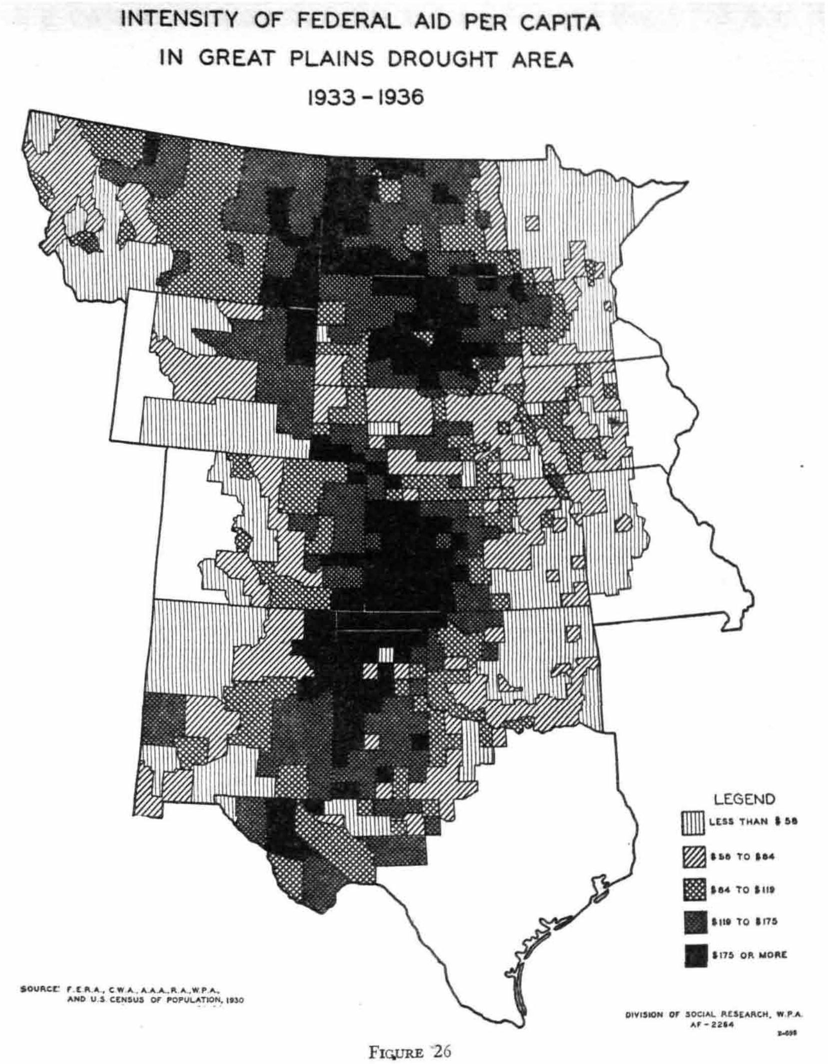
State	Total drought and cattle	Share of United States total
	Dollars	Percent
Colorado	9, 095, 668	5. 11
Kansas	14, 629, 605	8. 22
Montana	7, 192, 441	4. 04
Nebraska	4, 589, 268	2. 58
New Mexico	4, 771, 024	2. 68
North Dakota	7, 560, 575	4. 25
Oklahoma	9, 025, 004	5. 67
South Dakota	14, 489, 075	8. 15
Texas	22, 728, 461	12. 78
Wyoming	2, 174, 753	1. 22
Total 10 States	96, 255, 874	54. 10
United States	177, 881, 352	100. 00

[1] Adjusted to reflect redeposits of balances in the U. S. Treasury from Federally-administered States and authorized transfers between funds in all States. Transfers as of November 27, 1936, were not yet computed.

Includes entire State, not just those portions lying within the Great Plains area.

After a single year of fairly good rainfall, the Great Plains were again hit by drought in the spring of 1936. However, a shift occurred in

[7] In delineating the area of cumulated drought distress six indices were used; rainfall, crop conditions, pasture conditions, Federal aid, farms mortgaged, and migration. Federal aid was found, however, to measure with reasonable accuracy, the combined effect of the other five.



INTENSITY OF FEDERAL AID PER CAPITA
IN GREAT PLAINS DROUGHT AREA
1933 - 1936
LEGEND
LESS THAN $ 58
$ 58 TO $ 84
$ 84 TO $ 119
$ 119 TO $ 175
$ 175 OR MORE
SOURCE: F.E.R.A., C.W.A., A.A.A., R.A., W.P.A., AND U.S. CENSUS OF POPULATION, 1930
DIVISION OF SOCIAL RESEARCH, W.P.A.
AF - 2264

FIGURE 26

the type of relief extended. Throughout 1936 there was a decline in general relief as the various States adopted the public assistance features of the Social Security Act and as farmers were able to subsist on the proceeds of 1935 crop sales.

For further demonstration of the effect of the drought, attention may be called to the trend in relief population. The relief population of the United States increased from 11.3 percent of the total population in the fiscal year 1933–34 to 15.3 percent in 1934–35, a net addition of 4 percent. The increment in the Great Plains States was much greater. In New Mexico, South Dakota, Oklahoma, and North Dakota, for instance, the net additions were 19.2 percent, 17.6 percent, 11.3 percent, and 10.9 percent, respectively. All States in which there were large increases in the proportion of population on relief, relative to the increase in the country as a whole, had significant drought problems.

Characteristics of Farm Families on Relief and Rehabilitation.[8]—About 20 percent of all farmers in the spring-wheat area were on relief in June 1935, and 8 percent were receiving rehabilitation. In the winter-wheat areas the figures were 6 percent and 4 percent, respectively (Figures 27 and 28). There is an undetermined amount of duplication between relief and rehabilitation, since some clients were aided by both programs.

[8] Research Monograph No. VI, *Farm Families on Relief and Rehabilitation*, by Berta Asch, Division of Social Research, Works Progress Administration.

INTENSITY OF RURAL RELIEF* IN MAJOR SUBREGIONS OF THE GREAT PLAINS, FEBRUARY 1935, AND AREAS OF SPECIAL STUDY

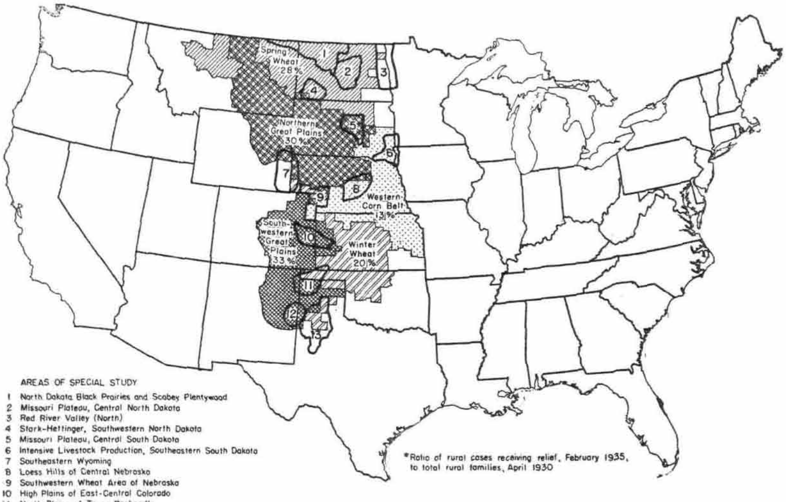
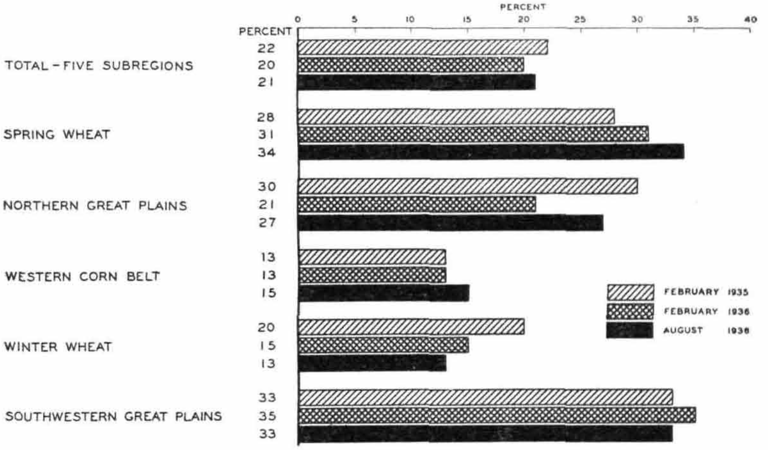


FIGURE 27

In both areas the tenant farmer was the typical farmer receiving aid, but in the spring-wheat area nearly half the tenants were on relief or were rehabilitation clients, while 16 percent of the tenants in the winter-wheat area fell into this category. The proportions for owners were far less in both areas. In the spring-wheat area in June 1935 more than 80 percent of the farm laborers on relief were not heads of families; for the most part, they were the sons and daughters of farmers. However, enough farm laborer heads of families were receiving aid to make up 10 percent of the agricultural relief load and 4 percent of the agricultural families on rehabilitation. In the winter-wheat area, on the other hand, nearly two-thirds of the farm laborers on relief were heads of families. Rehabilitation families differed little from those on relief, both groups being representative of their fellow farmers.

Tax Delinquency and Financially Embarrassed Local Governments

Characteristic of economic maladjustments in the Great Plains are high rates of taxation, extensive tax delinquency, and consequently severely embarrassed local governments. There are few taxable resources other than agricultural real estate, and, to a minor degree, personal



PERCENT OF TOTAL RURAL FAMILIES IN MAJOR SUBREGIONS OF THE GREAT PLAINS, RECEIVING PUBLIC ASSISTANCE IN FEBRUARY 1935[A], 1936[B] AND AUGUST 1936[B]

A. EMERGENCY RELIEF
B. ALL RELIEF FINANCED BY FEDERAL, STATE OR LOCAL PUBLIC FUNDS, INCLUDING WORKS PROGRAM EMPLOYMENT AND RESETTLEMENT GRANT CLIENTS.

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AF-2284

FIGURE 28

property, and accordingly the local governments have had to depend almost entirely upon the general property tax for their revenue. Not only has this resulted in extremely burdensome rates of taxation—in some counties in recent years constituting a capital levy of 3½ to 4 percent on the value of the property—but reliance upon only one source of revenue has made the fiscal position of the local units peculiarly vulnerable. Periods of low farm prices or of crop failure are immediately reflected in a high degree of tax delinquency. This, in turn, is taken into account in setting rates for succeeding years and a vicious spiral is set up which can end only in the bankruptcy of many individuals and in the fiscal disintegration of local government. Some indication of the extent and seriousness of tax delinquency in recent years may be seen in Figure 29. The areas in which the rate of delinquency is highest are in general those in which the need for land-use adjustments is most pressing.

The practice of issuing warrants or other evidences of debt in anticipation of taxes, under circumstances where collections already have been reduced by tax delinquency, has resulted inevitably in a large floating public debt. As the debt of a school district, for example, piles up without adequate provision for payment other than through delinquent tax collections, its credit wanes and its warrants are subject to increasingly heavy discounts. In a four-county area in South Dakota, a recent study [9] of public fiscal conditions shows that out of 63 school districts, one-third had outstanding warrants in excess of their entire tax collections in 1934. Three of these districts had more than nine times their 1934 tax revenues outstanding in warrants; one had eight times its collections; another, four; and a considerable number the equivalent of revenues for two or three years. In one of these districts the combined warrant and bonded indebtedness represented almost one-fourth of the total taxable valuation in 1934.

Impairment of Individual and Community Stability

The excessive amount of tenancy among the inhabitants of the Great Plains and the high degree of their dependency are both a cause and a symptom of individual and family instability. Naturally, this affects the stability of the community. High tax rates, extensive tax delinquency, and depleted public revenues seriously handicap the local governments of the Great Plains in providing essential social services.

The number of persons living on farms in the Great Plains Region as a whole has remained nearly stationary during the last 25 years, but this does not mean that there has not been migration within the area. For example, two-thirds of the farmers who lived in western Kansas in 1895 had left within ten years; and by 1935 only one-tenth of them were still in the same township, or had a son living in the same township. During recent years the movement has been even more rapid.

There has also been migration into and out of the Plains area: a two-way movement in which early Plains settlers moved out and in general their places were taken by others who came to the Region. The effect of the droughts of recent years has been to stimulate an outflow of people from the Region; it is estimated that 8,600 families have migrated from the drought areas to Washington, Oregon, and Idaho alone during 1936. The net result has been a slight gain in the more humid parts of the Region and a somewhat greater loss in the more arid parts.

Well-integrated community life can develop only where the population is sufficiently stable to take an interest in the improvement of community institutions and where the government is on a sufficiently sound fiscal basis to provide customary public services in an adequate manner. Where people are shifting about and governments for the most part are restricted in their finances, as in the Great Plains, public services are likely to be impaired.

[9] Unpublished study by Land Use Planning Section, Division of Land Utilization, Resettlement Administration; Jackson, Custer, Pennington, and Fall River Counties.

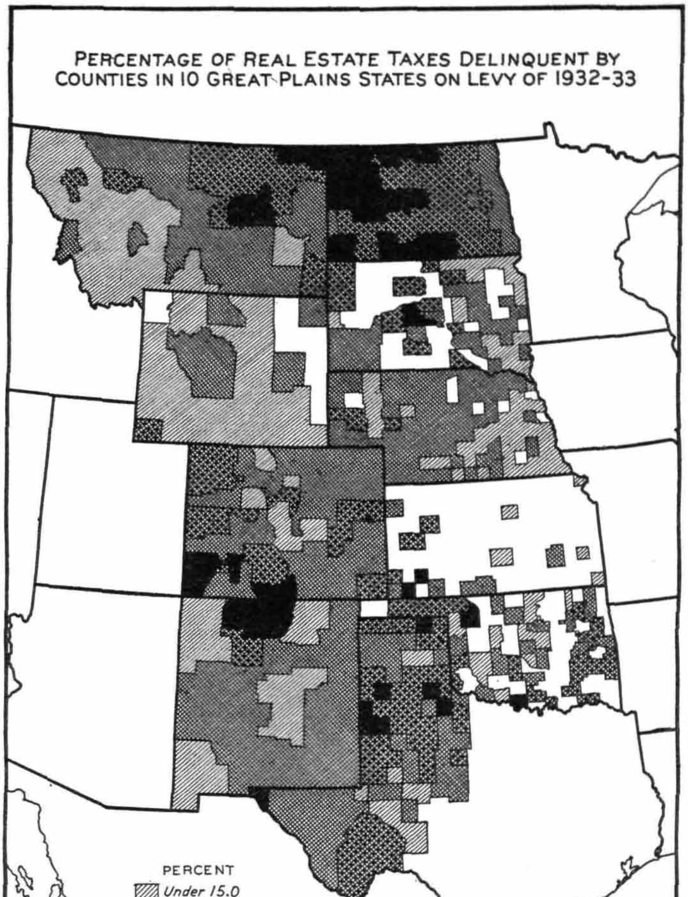
PERCENTAGE OF REAL ESTATE TAXES DELINQUENT BY COUNTIES IN 10 GREAT PLAINS STATES ON LEVY OF 1932-33
PERCENT
Under 15.0
15.0-29.9
30.0-44.9
45.0 and over
U. S. DEPARTMENT OF AGRICULTURE
NEG. 31574
BUREAU OF AGRICULTURAL ECONOMICS

FIGURE 29

Education is generally recognized as one of the primary responsibilities of local government. A study covering the period 1920–32 indicates that many of the Great Plains States, though they spent a relatively large share of their tax resources for education, succeeded only fairly well in meeting essential educational needs.[10] It should be kept in mind, of course, that the scattered distribution of the population increases materially the expense of providing education. Where per capita costs are high and funds are low, the quality of schooling which can be provided naturally suffers.

In recent years, outside aid has been necessary in some sections to enable the schools to remain open. The Federal Government, through the Civil Works Administration and later through the Federal Emergency Relief Administration, has provided funds for the continued payment of literally thousands of rural school teachers. In 1933–34 and 1934–35 the ten Great Plains States received for this purpose nearly $5,000,000, not including over $4,000,000 for the emergency education program. This program, while affording temporary relief, cannot be expected, nor is it designed, to solve the fiscal problems of local government which have grown out of land settlement and land use of a haphazard nature and not adjusted to critical natural conditions.

The provision of health service is another example of the manner in which local governments in the Great Plains are handicapped. Again the distribution of the population is a complicating factor; even where there are full-time county health officers and workers they must often travel long distances to reach the people in the area under their supervision. Impoverished governmental units rarely have funds to maintain hospitals and other pertinent services; and the expense of private service in many places is beyond the capacity of most people. The regular fee plus one dollar per mile is charged by some physicians in the Region. The effect upon the public health can be realized when it is known that many of the health problems of the Plains Region arise from the inability of the people to avail themselves of professional consultation. This, for instance, explains in large part the high maternal and infant mortality rates reported for the area.

[10] "The Efforts of the States to Support Education", *Research Bulletin of the National Education Association*, Volume XIV, Number 13, May 1936, page 141.

Chapter V

ATTITUDES OF MIND

Why should there have been destructive tendencies in the use of land and water in the Great Plains? Chiefly, of course, because of the settlers' lack of understanding concerning the critical differences between the physical conditions of the Great Plains area and those of the area east of the Mississippi whence they had come. Because of this lack of understanding the colonists applied agricultural practices brought from a humid region under conditions for which they eventually proved to be unsuitable. Practices, however, are but outward expressions of controlling attitudes of mind. These settlers also brought with them inherited assumptions which had become ingrained through generations of pioneering experience in a humid region; assumptions which in large measure account for the practices that are destructive in a sub-humid region.

These basic attitudes of mind are the directive forces that establish the framework of a new society, govern the activities of the people, and become their standards of judgment. In the course of time they tend to crystallize, fail to take account of new conditions, cease to serve their original purposes, and frequently hinder necessary readjustments.

Therefore, rehabilitation of a great region in which it has been discovered that economic activities are not properly adjusted to basic and controlling physical conditions, is not merely a problem of encouraging better farm practices and desirable engineering works, and revision of such institutions as ownership and tenure. It is also one of revision of some of the less obvious, deep-seated attitudes of mind.

The basic purposes of economic life do not change. The desire for security, stability, a rising standard of living, increased leisure, self-expression and creative work, remain fairly constant. It is the ideas concerning ways and means by which these objectives may be achieved that must be subject to revision.

That Man Conquers Nature.—It is an inherent characteristic of pioneering settlement to assume that Nature is something of which to take advantage and to exploit; that Nature can be shaped at will to man's convenience. In a superficial sense this is true; felling of trees will clear land for cultivation, planting of seed will yield crops, and applications of water where natural precipitation is low will increase yields. However, in a deeper sense modern science has disclosed that fundamentally Nature is inflexible and demands conformity. On this point Aldo Leopold has well said: "Civilization is not . . . the enslavement of a stable and constant earth. It is a state of *mutual interdependent cooperation* between human animals, other animals, plants, and the soils, which may be disrupted at any moment by the failure of any of them. Land despoliation has evicted nations, and can on occasion do it again. . . . It thus becomes a matter of some importance, at least to ourselves, that our dominion, once gained, be self-perpetuating, rather than self-destructive." [1] We

[1] "The Conservation Ethic", *Journal of Forestry*, Vol. XXXI, No. 6, October, 1933, p. 635.

know now, for instance, that it is essential to adjust agricultural economy on the Plains to periods of deficient rather than of abundant rainfall, and to the destructive influence of wind blowing over dry loose soil rather than primarily to a temporary high price for wheat or beef; that it is our ways, not Nature's, which can be changed.

That Natural Resources are Inexhaustible.—That resources are inexhaustible and can absorb an indefinite population, and that settlement and development will continue into the distant future are assumptions that are natural in the early period of settlement of a vast new territory. In 1827 the Secretary of the Treasury reported [2] that it would take "ages to come" to settle the public domain. The following year Senator Benton of Missouri declared that it would take "about 2,000 years more to complete the sales (of public land) to the head of the Mississippi and to the foot of the Rocky Mountains." [3] Yet today people are moving out of the Great Plains area because it appears to be too crowded in an economic sense. Probably it is not permanently too closely settled in this sense, but in terms of the type of occupancy and utilization which have been allowed to develop because natural resources were considered incapable of depletion, it is for the time being, and for a time may continue to be, economically congested. Superficial views of inexhaustibility must be discarded.

That Habitual Practices are the Best.—It is also a natural attitude to assume that agricultural practices which have served a people well in territory from which they have migrated, will serve them equally well in new settlements. Man clings to the accustomed, the proved; that at which he is expert. The agricultural technique of humid England produced crops on the Atlantic seaboard, and later in the territory immediately beyond the Allegheny Mountains; therefore, in view of the then limited knowledge of basic physical differences, it was inevitably assumed that this technique was suitable for the farther Plains Region. It is now known that on the Plains the basic physical conditions are radically different from those east of the Mississippi; that even as between the ten States included in the area there are striking variations. In fact, as between one county and that adjacent there may be differences so fundamental as to require unlike agricultural and economic regimens in each. The prudent assumption must be that the technique of one locality is not suitable for another until it has been so proved.

That What is Good for the Individual is Good for Everybody.—It has been a dominating American attitude that "whatever is good for the individual is good for the whole." Under pioneering conditions there has been apparently net social advantage in action according to this point of view. If anyone acquired some portion of the free natural resources and turned it to productive use, he was, under the circumstances of the time, rendering a service to the entire society. To all it appeared that unused land was being put to use. A family settling in Indiana a hundred years ago realized immediate advantage, as also did the Nation, in felling and burning a tract of black walnut to get at the soil underneath for the production of grain. Although the walnut forest on a perpetual yield basis might be of more value than the cleared land to their descendants and to the people of the United States now and in the future, there is no social accounting adequate to prove that there is net loss. But we know now, in the light of bitter experience, that many recent activities on the Great Plains—for instance, the plowing under of certain sod lands to gain immediate advantage for an individual from coincidence of adequate rainfall and a high price of wheat—have demonstrated that only too frequently what appears to be of immediate good to the individual in the long run is not good for the people of the region, and even for the individual. There must be general revision of this assumption with due consideration given to the fact that self-interest in the long run coincides with the social interest.

[2] *Annual Report,* p. 406. [3] *Congressional Record,* Senate, April 9, 1828.

That an Owner May Do with His Property as He Likes.—The early colonists brought with them the tradition of the English common law that a man's house is his castle; that he may do as he will with what he owns. Ownership carried privileges but not obligations. This doctrine grew in strength in the United States, because a sparsely settled frontier region is particularly suitable for its maintenance. In the nature of pioneer circumstances generally the handling of one owner's property would not affect that of his neighbors. It is not until settlement becomes more congested, farms are located close together, and various economic institutions develop, such as specialization and credit, that this doctrine begins to crumble. Migrating sand dunes, exposed subsoils, increasing acres of dead lands, and the necessity for extensive public assistance are warnings that old assumptions concerning property rights must be substantially revised.

That Expanding Markets Will Continue Indefinitely.—The past century of development of the United States until recently has been one of expanding markets, domestic and foreign. The increasing industrialization of western Europe and the eastern United States, and the rapid growth of population, for a long time placed a heavy and expanding demand for foodstuffs and raw materials on the agricultural sections of the United States. These circumstances gave rise to the assumption that the heavy world demand for agricultural products—in some minds even the rate of increase—would continue indefinitely. The World War and the consequent economic crash broke down both demands. The war stimulated foreign countries to attempts to become self-sufficient. The economic crash for the time being destroyed the domestic industrial market. The domestic demand surely will be restored; and eventually, but probably only after a considerable period, a portion of the foreign demand will revive; but the only prudent attitude today is that there must be a guided alignment of agricultural production to demand, and that all agricultural producers should plan accordingly.

That Free Competition Coordinates Industry and Agriculture.—Under the traditional free market system the assumption was held that automatic forces promoted both increased productivity and the interchange of goods between agriculture and industry, which resulted in gains for the people engaged in both fields. The assumption held that when demand declined, prices were reduced until it was restored, and the volume of production and exchange was kept substantially unchanged. However, free price competition no longer functions automatically throughout large sections of industry. The rise of large-scale intercorporate organizations combined with the development of industrial technology, has resulted in an extension of price control in industry. Today the tendency in industry is to attempt to maintain prices virtually unchanged, and to vary the volume of production for that purpose. This may maintain the price, but it means reduced sales, production, and employment, and consequently reduced purchasing power, for agricultural and other products.

Agriculture is inherently handicapped in following this practice. The inherent nature of agriculture is such that when its prices decline the farmer must strive to make up his loss of income by producing more. The experience of the recent depression was that agricultural prices fell far more sharply than industrial prices; that farm production continued to be maintained while factory output was curtailed. The absence of a free market for industrial products in which competitive forces could bring about necessary readjustments between agriculture and industry resulted in widespread distress, the manifestations of which are all too familiar today. The flexible price system of agriculture and the inflexible price structure of industry are incompatible. Together they operate to promote the exploitation of raw materials and to restrict the output of manufactured products. Industry, through price control, maintains itself in part at

the expense of agriculture. The future stability of agriculture depends upon a better price adjustment with industry; in part by adjustment of agricultural production, in part by adjustment of industrial prices.

That Values Will Increase Indefinitely.—The long period of appropriation and development, and of expanding markets, was one of increasing capital values. Land represented not only the means of livelihood but also the opportunity for acquiring pecuniary wealth quickly. According to English economic theory, a constantly growing population meant increasing competition for the means of subsistence, which in turn causes a progressive advance in land values. Under these circumstances, it was assumed that the mere passage of time assured a profit to the possessor of the resource which was in demand. An owner of farm land might not make operating expenses but generally he could count on capital appreciation. He could operate inefficiently and be wasteful of natural resources, and yet realize a gain through enhanced realty values. The nineteenth century was a period of continuing automatic inflation; every new farm occupied and other resource appropriated and valued became the basis of a new credit. Future income was discounted currently. A vast superstructure of credits was erected upon the basic equity of the landowner, and these were preferred claims on the income the land produced. Much of the borrowing and many of the mortgages were to facilitate the inflation of land values and not for the improvement of property. Book values of land became fictitious creations without any counterpart in physical productivity.

This long period of increase in capital values stimulated the growth of two assumptions: that farm land may properly be made an object of speculation; and that in such speculation a buyer may prudently assume large debts because the unearned increment exists in the background as a factor of safety. Too few have realized how circumstances have changed. The new assumption must be that farm values should be measured by earned income; that resources must be carefully conserved and apparent income from their deterioration be counted not as income but as capital loss; that debt may become a dangerous enemy; and that agriculture is not possessed of "get-rich-quick" characteristics, but is a mode of life that gives sustenance and great satisfactions to generations who husband their resources wisely.

That Tenancy is a Stepping-Stone to Ownership.—It has long been assumed that if a person desired to farm but lacked the capital with which to buy land, he could use the status of tenancy as a stepping-stone to ownership. From the tenant's share of the farm income he would soon accumulate sufficient savings to command a loan to buy a farm of his own. By exercising patience and labor the tenant would find that the land would earn its purchase price. The Nation, so it was believed, was to be a land of owner-operated farms. The success of this doctrine, however, depended on the maintenance of conditions which no longer exist. As long as ample supplies of free land were available, the rate of increase in the price of land was curbed. With the disappearance of free land, realty values were increased out of proportion to the annual earning power of a farm, and diminished the ability of the tenant to purchase. Many tenants with years of experience have failed to cover their operating expenses, or the margin left to them after paying the landlord has been so small that they have been virtually forced to continue as tenants. The labor income has been barely sufficient to provide subsistence, much less afford a basis for savings with which to purchase land. "It has been difficult enough in the past for a young man to climb the ladder from hired man to tenant to owner of a farm;" today, except under the most favorable circumstances, it is well-nigh impossible.

That the Factory Farm is Generally Desirable.—The age-old circumstance has been that agriculture is a mode of living and of livelihood combined, consisting of production for a family's

own use and for the market. The farm has been essentially an organism, complete and self-sustaining in itself. Families have occupied the same farms for many generations. Such rural life has constituted the backbone of every nation fortunate enough to possess it.[4] However, in the United States during the period of expanding markets, the assumption has appeared that ownership can be separated from the mode of living and responsibility for operations, and can become a source of investment income for non-resident owners. The growth of this assumption has intensified such anti-social institutions as tenancy and destruction of soil assets. While large-scale commercialized farming may prove to be economically permanent and socially advantageous in limited areas and with respect to certain products, inherently it is destructive of stable agriculture generally. The rural problem of adjustment to Nature, conservation of resources, stable income, and a lasting, satisfactory standard of living, apparently calls for reestablishment of "the balanced farm." Permanent agricultural stability calls for recombination, insofar as possible, of farming as a mode of living with farming as a source of livelihood.

In this connection, O. E. Baker has concluded that "there is no substitute for the institution of the family. . . . For the better utilization of our arable land the writer has full faith only in the family farm, and in the family farm only in the case of the family with continuity of life and occupancy of the land. And continuity of family life and of land occupancy is dependent on a philosophy of life. There will not be, he fears, much better utilization of farm land in the United States, until more farmers pass the farms on to their sons."[5]

That the Individual Must Make His Own Adjustments.—A final assumption to which we desire to call attention—one which has accompanied settlement and development of the Great Plains, and of agriculture generally in the United States—is that the individual should be left, in the main, to make his own adjustments to calamity. Fire, flood, drought, or grasshoppers: one must migrate, or go in debt, if that is possible, and start all over again. Both migrating and starting over again were relatively simple matters in the earlier day because free land was available elsewhere, values were appreciating, and one had a reasonable chance of becoming reestablished. It was in the final analysis not so much a situation in which the individual did his own adjusting in a commercial environment, as of Nature's standing by his side ready to give him aid with new land. That circumstance no longer exists. The individual who suffers calamity today is permanently handicapped, and the handicap may affect several generations. The new assumption must be that the community, the State, and the Nation must so cooperate in controlling the conditions which cause calamities that these will be eliminated, or at least substantially reduced.

These are a few of the more common assumptions that have governed conduct in agricultural settlement in the United States, and particularly in the great West. They must be revised in order that there may be a proper environment for achievement of the purposes of our recommended program; that all lines of action may be made to focus on a common social objective.

Self-interest is a powerful and useful force, but if the institutional environment is out of balance with the physical, self-interest has too free an opportunity and may lead to self-destruction. If institutional and physical environments are in balance, self-interest coincides with social interest. The usefulness of an institution depends on the degree to which it brings these two interests into adjustment.

While there must be a tolerable degree of direction along democratic lines of non-cooperating individuals, there must be, above all, common understanding and a common will to action.

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[4] See O. E. Baker, "The Agricultural Prospect", Chapter IX of *Our Natural Resources and Their Conservation*, edited by A. E. Parkins and J. R. Whitaker, p. 231.

[5] O. E. Baker, p. 233.

Part III

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PROGRAM OF READJUSTMENT AND DEVELOPMENT

Chapter VI

LINES OF ACTION

The history of the Great Plains is a story of contrasts; of nourishing rains and withering droughts, of bountiful harvests and crop failure, of optimism and despair, of advance and retreat by settlers. Now, as in the past, the Region is one of economic and social instability. Such it will remain unless fundamental readjustments in land use are made that involve comprehensive action by government—Federal, State, and county—as well as by individuals. The lines of action essential to successful readjustment are recommended and briefly discussed in the following paragraphs.

I. Lines of Federal Action

1. *Investigations and Surveys.*—Although enough is known about conditions and their causes generally throughout the Great Plains and in detail with respect to certain parts, to direct immediate and vigorous action, it is recommended that provision be made promptly for further investigations and surveys needed to determine in detail the best prospective use of lands, waters, and other natural resources in every section of the Region. It is recommended further that the primary program of intensive investigations and surveys be completed in a period of not more than ten years.

The need for the proposed investigations and surveys is urgent and immediate. It is proclaimed anew by the tragic experiences in recent years of many thousands of settlers throughout the length and breadth of the Plains. To depend, as in the past, chiefly on the long-run tendency of economic conditions to bring about the use of the lands, waters, and other resources of the Region in the ways in which they would have greatest value would be most unwise. That process would be far too slow and far too costly, both in funds and in misdirected human effort.

Facts are indispensable prerequisites to readjustments in the use of land and water; in operating units, land ownership, and land tenure; in cultural practices, and the like. Much valuable information concerning various conditions in the Great Plains has been assembled through investigational work in past years, but for most parts of the area available data are too meager or too general in character to provide an adequate basis for the public programs which are necessary. Investigations and surveys are needed for many parts of the Region as detailed and varied as those reflected in the maps of Appendix 5, which cover part of a representative county in Montana.

Studies of climatic risks should be continued. Topographic and soil surveys of the Region should be completed. Studies of conditions of soil erosion and of appropriate remedial measures should be made on the many types of land found in the area. Land classification surveys should be made to locate definitely the poor plowland which should be regrassed, the grass land which is suitable for tillage, and the grass land which should retain its natural cover. The productivity of lands suitable for cropping and the carrying capacity of permanent grass lands should be determined. The distribution and magnitude of the available and potential

water supplies, both on the surface and underground, should be ascertained. The possibilities of new irrigation projects, with special attention to those of small size, should be evaluated, and feasible sites for the storage of stock water should be located to meet prospective needs in as large measure as practicable. Grazing districts should be delimited and proportional adjustments formulated between grass land and feed-crop land. The patterns of ownership units and of operating units should be mapped and desirable changes in the patterns should be determined and mapped, so as to show, among other things, whether they involve the combination or the division of units and whether or not they involve public acquisition of land. Prospective needs for resettlement, alternative occupational opportunities for people not enjoying a decent standard of living, the economic capabilities of such people, and the relative utility of particular methods of accomplishing the desired results for the inhabitants of the Region, should all be explored.

The statements of the preceding paragraph illustrate the varied character and interlocking relationships of the investigations and surveys that are recommended. As they indicate, facts that are needed as a basis for a flexible program of sound action relate in some instances to physical conditions and in others to cultural conditions. Certain investigation projects may best be assigned to Federal agencies already concerned with them in greater or less measure in the Great Plains as in other parts of the country. So far as the nature of a given project permits, however, it should be undertaken jointly by Federal, State, and local agencies. The Federal Government could not, even if it so desired, successfully impose a program of readjustment for the Great Plains on the States and communities of the Region. Moreover, the States and local communities have responsibilities in most of the matters involved, and these responsibilities cannot be shifted properly to the Federal Government. However, effective cooperation will necessitate the services of a Federal coordinating agency, and those of cooperating agencies in each State containing a portion of the Great Plains.

2. *Federal Acquisition of Land in Range Areas.*—It is recommended that the Federal policy of purchasing scattered crop farms and other appropriate lands in areas devoted largely to grazing and suited best to that purpose be continued conservatively, and that appropriations or allocations be made accordingly for the purpose.

Various considerations doubtless will influence the rate at which land in the range areas of the Great Plains is purchased by the Federal Government, if the policy of acquisition is continued as recommended. It will be affected by considerations of financial policy, and for that reason alone may vary notably from time to time. Although it seems desirable to make whatever readjustments may be accomplished solely or in the best way through Federal acquisition in as short a time as practicable, the rate of purchase should conform to the requirements of sound procedure. Thus, the appraising and optioning of land by a trained personnel and the process of title clearance will be factors of importance in the future as they have been in the past. Again, where sufficient data are not in hand, action should await the availability of adequate knowledge with respect to the character of the lands that might be purchased, their present use and their potentialities, the condition and needs of those who now use them, and the like. Reliable information on such matters is lacking for most parts of the Region and it can be gained only through investigations of the types already recommended.

In general, the lands that should be acquired lie mainly in the western and drier parts of the Region, particularly in the areas unfit for tillage. Progress in sound acquisition could be expedited by giving such areas appropriate priority in the recommended program of basic investigations. In some instances the desired readjustments, notably prevention of the continuation or recur-

rence of unregulated grazing and undesirable and uneconomic land occupancy, may be found to be possible and practicable by means other than Federal purchase. Thus, public ownership of large acreages may be obtained by counties through tax forfeiture. Federal acquisitions should be kept in harmony with such possibilities. Moreover, the Federal Government should not purchase either county-owned or State-owned land unless, in rare and unusual circumstances, such action should prove unavoidable in the development of a constructive program of range utilization.

Finally, the rate and the distribution of acquisitions in the immediate future should be influenced appropriately by: (1) existing knowledge concerning the acuteness of the human problems of maladjustment in land use; (2) local sentiment toward the establishment of a Federal land acquisition project or the extension of an existing project; and (3) the desirability of blocking in and rounding out present projects to achieve economies in administration or for other purposes. So far as practicable, priority should be given during the next year or two, to purchases from resident landowners whose scant resources prevent a satisfactory standard of living in their present location; to purchases in counties where land acquisition is already in progress and in other counties where want is combined with popular support of the purchase program; to such purchases from non-resident owners as may be necessary under the conditions prevailing in the areas involved, to permit a desirable adjustment and control in the use of the land; and to purchases of land already appraised and, in some instances, optioned. Approximately 7,000,000 acres of land that cannot be acquired with present funds have been appraised in connection with established projects, and of this total more than 2,000,000 acres were at one time under option. Undoubtedly this acreage could be acquired, in large part at least, at a very reasonable cost were funds available, and it could be handled through existing project offices.

It has been estimated roughly that some 24,000,000 acres in the Great Plains might well be acquired by the Federal Government and other agencies to protect the land and promote its best use, to provide opportunities for creating grazing districts, and to assist existing grazing districts in obtaining better control of their range. One of the major objectives of a long-time plan for the Region is the return of certain inferior crop lands to permanent range uses. In general, this may be accomplished best through public acquisition of such lands. Under private ownership, and without means of public control over use, uneconomic crop farming and land speculation are inevitable in every series of relatively wet years. Indeed, only an enlightened public opinion will prevent at some future time the reopening of non-arable public lands in the Great Plains to private acquisition and unwise use for crop production.[1]

At the present time, somewhat more than 5,000,000 acres have been acquired or are in process of acquisition by the Federal Government in the Great Plains as a means of effecting a constructive program of land use in areas whose best use appears to be as range. With the present machinery for Federal acquisition of land, approximately 6,000,000 acres could be acquired yearly in the Great Plains.

3. *Control and Use of Lands Acquired by the Federal Government in Range Areas.*—It is recommended that a substantial proportion of the scattering parcels of privately owned land situated within the limits of Federal grazing districts established under the Taylor Grazing Act be purchased by the Federal Government. As long as the Taylor Grazing Act lays primary emphasis on priority of range rights, it appears desirable that the purchased lands be retained under the control of a Federal agency free to distribute the corresponding range rights with due consideration for the objectives of rehabilitation and the maintenance of as large a number of families as practicable, as well as consideration

[1] See p. 86.

for existing priorities. It is desirable, however, that the administration of the purchased lands and the interspersed public domain be carried on in accordance with the general terms of a cooperative understanding between the Department of the Interior and the agency administering the purchased lands, similar to the agreement into which the Department of the Interior and the Resettlement Administration have entered. Under this agreement both parties undertake to cooperate in determining carrying capacity, deciding on improvements, formulating rules, and fixing range fees. Each agency, however, makes its own distribution of range rights. It is recommended that parcels of land purchased by the Federal Government in areas where there is no public domain or where there is not enough to justify the establishment of grazing districts under the Taylor Act, be leased in accordance with current practice to cooperative grazing associations. In the interest of consolidated administration any scattered areas of public domain within such purchased areas should be turned over to the purchasing and administering agency. These lands should be leased to the grazing associations under restrictions similar to those governing the lands made available to them within Federal grazing districts. The Federal agency acquiring land in a particular area should cooperate with the local grazing associations in the formulation of rules, regulations, and policies with respect to carrying capacity, rate of stocking, and other "rules of the range", but necessarily would have final word in approving such conditions. In such cooperative undertakings, approved technical methods should be followed in determining the carrying capacity of the lands to be used as grazing commons. The Federal agency should reserve the right to promulgate rules, regulations, and policies with respect to prior use, dependency, commensurability, and preferential treatment of applicants for grazing permits.

The provision of a dependable supply of range forage to livestock owners through joint action with cooperative grazing associations would make unnecessary in some areas the creation of larger individual operating units. Many stockmen now prefer to obtain additional grazing facilities from a grazing district rather than to assume the responsibilities of owning and managing more land. Public acquisition and cooperative control of judiciously selected lands would facilitate readjustments not only in the land-use patterns but also in the population patterns of the areas involved. Cooperative grazing associations would be aided in developing a manageable ownership pattern within their boundaries. Overgrazing on the public lands involved would be prevented by a system of local self-regulation under Federal guidance.

4. *Measures to Increase the Size of Farms.*—It is recommended that assistance in the enlargement of undersized operating units be provided (1) through extension of credit under suitable restrictions, and (2) experimentally through Federal purchase of selected land and its subsequent lease or sale under covenants protecting its use.

Over much of the Great Plains many farms are too small to yield an adequate family living, particularly if a shift to more extensive use such as pasture, or less frequent use of land for soil depleting crops, is necessary to conserve the soil.

The use of credit to effect an adjustment toward larger farms is recommended in areas where the holdings that need enlargement are so widely scattered that public administration of purchased areas would be unduly expensive; provided however, that the applicant is a proper credit risk, and also that the extension of credit is made contingent upon a commitment by the borrower to use his entire holdings in accordance with specified conservation practices.[2] However, in areas where the farm holdings needing enlargement are numerous, it is recommended that the lands to be added to existing holdings, be purchased by the Federal Government and leased to the operators of the farms needing enlargement. This recommendation is made

[2] See Supplement, Memorandum I.

because such a policy is more elastic, affords the Government greater ability to assure conservation practices, involves little, if any, greater outlay, and would carry greater assurance of the continuance of the economic size of holdings thus established. It would also help to prevent land speculation and the necessity of individual operators who are already overburdened with indebtedness, having to assume further obligations and the attendant risks.

Federal acquisition of land with a view to building up larger units of operation should be undertaken first on a restricted scale, and should be expanded only after the apparent advantages of the procedure have been demonstrated. Demonstrational projects should be established in selected areas where a material reduction in the number of farms is known to be necessary, and where the units to be enlarged are sufficiently numerous to permit reasonably economical administration.

Preliminary investigation has disclosed the more important areas within which many of the farms are too small to afford an adequate family living and permit the maintenance of soil productivity. Before a program to acquire land to consolidate or enlarge farms is inaugurated, definite standards as to adequacy of living should be set up. The minimum size of unit which can be expected to support a family according to the defined standards should then be determined for each important type of land. Without such determinations, adjustments in size would tend to be made arbitrarily and inequitably. The pattern of operating units should be mapped and the location of inadequate units should be determined before offers to sell or applications for loans or leases are accepted. Otherwise, it would be difficult to build up some units without disturbing the adequacy of other units.

Applications for assistance in creating larger units should contain evidence in support of the claim that a larger unit is needed. This should be checked against information already in hand indicating (1) the inadequacy of the unit as to size, and (2) the possibilities of making it adequate through addition of contiguous or neighboring land without seriously disturbing other units. Appraisers also should examine farms offered for sale with respect to their usefulness in creating larger units by addition to adjoining or nearby farms.

If, in the judgment of the supervising agency, the additional land needed in a given case can best be acquired by leasing it from private individuals, this procedure should be recommended to the farm operator concerned. In the case of units which may best be enlarged by a loan to enable the operator to acquire additional land, such action should be recommended to the Farm Credit Administration, or, if the operator prefers, to private credit agencies.

The proposed program should be carried out in all its phases *on a voluntary basis*, with the full consent of the operator whose holding should be enlarged and of the owner of the land to be leased or sold for that purpose. The essence of the program is to assist holders of under-sized operating units to enlarge their acreage.

The acquisition of under-sized farms and the consolidation of them with others, would tend to relieve many families in stranded circumstances and assist them to find better opportunities elsewhere. At the same time, the program would tend to reduce the intensity of land use and thereby promote stability in such use. It is estimated that the purchase of 7,000,000 acres of land now operated in farms or ranches that are too small would relieve 20,000 stranded families by enabling them to relinquish uneconomic holdings on which they cannot be rehabilitated, and at the same time benefit 20,000 other families on unduly small farms by making the acreage thus released available to them. The families that would be relieved probably have absorbed $10,000,000 of public aid annually during the drought period. The cost of adjusting the size of farms would not seem exorbitant in view of the possibility of eliminating the expense incident to periodic alleviation of distress.

5. *Development of Water Resources.*—The greatest natural handicap of the Great Plains is lack of sufficient rainfall. No device for supplying water to dry land can succeed without the water. The original source of water is precipitation, everywhere relatively scant in the Great Plains and highly variable in its distribution from place to place and from time to time. Mitigation of the effects of drought involves, among other things, such control and regulation of the unreliable supply as may be possible and feasible, and an adjustment of land and water economy to that supply. No more is possible; and the current popular emphasis on new supplies of water for large parts of the Great Plains, by which irrigation farming may widely replace dry farming, rests on hopes inevitably doomed to disappointment. It is often said that the people of the Great Plains have become "water minded." Sound water-mindedness will recognize the basic facts of nature which man is powerless to alter.

The Water Resources Committee of the National Resources Committee recently has completed, in cooperation with State and local agencies and with other Federal agencies, a report on Drainage Basin Studies in the United States. For the Great Plains, as for other parts of the country, the report briefly sets forth the principal water problems of the various drainage areas, or provides for their approach through nation-wide studies and demonstrations; outlines an integrated pattern of water development, control, and utilization to solve those problems; and presents specific construction and investigation projects as elements of the integrated pattern and plan, with priorities of importance and time. Other projects are dependent upon results of proposed studies, and naturally will follow if warranted thereby. It is impracticable to outline here the extended findings and recommendations of the report with respect to the Great Plains. Certain observations may be made briefly, however, that have particular significance with respect to the readjustment and stabilization of land use.

a. Needed improvements of stock-water supplies on public grazing lands constitute the chief water problems of such lands. Over wide areas all the supplies that can be developed at reasonable cost will be required for domestic and stock purposes.

b. Irrigation at best can cause only minor changes in the economic life of the Great Plains. The scarcity of surface run-off (only about 5 percent of the rainfall reaches the main river systems) and the lack of large supplies of underground water, limit the total possible irrigation development at reasonable cost to less than 2 or 3 percent of the land area. Moreover, much of this land lies in the eastern portions of the area where recurrent humid and subhumid years encourage farming without irrigation. Irrigation projects in the area have failed repeatedly because the ditches and appurtenant works were abandoned in years of plentiful rainfall. Most new large-scale projects are of doubtful feasibility under present reclamation policy. Medium-sized projects probably will yield more substantial benefits.

c. Other factors mitigating against large-scale irrigation projects are: (1) the high cost of storage works on streams heading in the Great Plains; (2) the already acute shortage of water on the streams which rise in the Rocky Mountains south of the Yellowstone (there is urgent need for importation of water from watersheds outside the Great Plains area into the Platte and Arkansas basins to supplement existing supplies); and (3) the lack of experience in irrigation farming by most Great Plains farmers. New projects affecting more than a few thousand acres would tend to develop independently of adjacent grazing systems, but would have the advantage of helping to preserve population density in sections which might otherwise suffer from outward migration. Federal financing of new projects under the terms of repayment set by the National Reclamation Act would not be successful in all instances.

d. There are scattered opportunities for the

development of medium-sized irrigation projects of about 500 to 1,000 acres in conjunction with storage reservoirs on tributaries or pumping plants on major streams. These should be planned with a view to integrating the management of forage production with that of grazing on adjacent lands, and to insuring efficient design and operation of works. The Bureau of Reclamation should be authorized to cooperate in investigations of proposed projects, and to aid in financing on a repayment basis those feasible enterprises which cannot be financed locally. Some recent ventures of this type have been highly ineffective because of lack of experience in the design of works and the application of water. Federal-State extension work in irrigation farming should be extended to the Great Plains.

e. The shallow underground waters of the Great Plains generally are adequate to supply only domestic and farmstead demands. They are not plentiful, and over large sections are almost wholly lacking. Deep supplies in the major artesian basins are in danger of overdraft, or already have been seriously depleted. "Hidden rivers" are rare and insignificant. Increased drafts upon ground water for irrigation therefore are practicable only in a few favorable areas.

f. Demonstrations carried out on a large scale by the Soil Conservation Service in a number of representative localities in the Great Plains, together with experiments at State and Federal experiment stations, show that run-off water can be stored by practicable methods in the more favorable soils in amounts that will contribute substantially to increase in the growth of grass and farm crops. It is reported by the Soil Conservation Service, for instance, that the emergency listing program carried out early in 1936 in the Southern Plains with relief funds, resulted in the contour listing of some 2,400,000 acres, and that all or most of the rainfall of May of that year was held on the land. It is further reported that over most of this treated area, considerable feed was produced in spite of the following severe drought; and that all the land produced enough vegetative cover to stabilize the soil against excessive wind erosion during the 1936–37 blowing season. On adjoining untreated lands of similar character moisture from the 1936 spring rains penetrated to only about half the depth to which it was stored in the contoured areas, and not enough vegetation was produced to safeguard the soil from blowing, even temporarily. The Service reports that in the Southern Plains where level terracing was combined with listing, even better crops were produced than where the land was treated with listing alone. In numerous contour-furrowed pastures of the Plains Region substantial gains in the growth of grasses and other grazing plants resulted, as compared with similar grazing areas not furrowed.[3]

Every possible effort should be made to encourage the spread to all of the adaptable lands of the area, of those measures of farm practice, discussed on p. 85, which have proved valuable as water-conserving measures.

6. *Resettlement.*—As already noted, restless movements and counter-movements of people always have been characteristic of life in the Great Plains. One of the tragic consequnces of the excessive droughts experienced by the Region in recent years has been the desperate and unguided migration of families in search of some source of livelihood. It is reliably estimated that not less than 165,000 people, or approximately 40,000 families, have moved away from the Great Plains drought area since 1930. Many more would have been forced to leave but for the emergency credit and relief funds poured into the area.

Many who have left are earning a precarious living from casual labor on the Pacific Coast. Others have settled on cheap cut-over lands, and are finding the struggle for a livelihood as desperate as before. Still others are on relief. Comparatively few have improved their eco-

[3] See Appendix 3.

nomic status. Many people who remained in the Great Plains have exhausted, or nearly exhausted, their resources; have been receiving public relief; and have little reason to hope that without further public aid they can establish themselves on a permanently self-supporting basis, even if economic conditions in general are good and a period of super-normal rainfall shortly begins in the Region. Emergency relief measures, involving resettlement in part, therefore must continue for a time. Moreover, severe droughts undoubtedly will result from time to time and until their effects are sufficiently reduced by the results of the long-time plan here proposed, by crop insurance, or by other appropriate means, emergency measures probably will be necessary from time to time on a diminishing scale. Such measures, whether or not they involve resettlement, should not conflict with a long-time plan for the Region.

A certain measure of resettlement necessarily would result from adoption of several recommendations already made. It would result from Federal acquisition of selected lands in range areas; from measures to increase the size of farms; and from development of the potentially available water resources. It may well be an important consideration underlying the purchase, in some instances, of lands that are marginal or submarginal from the standpoint of crop production.

Suitable homes and opportunities for people of the Great Plains desiring assistance in relocation should be found, if practicable, within the Region; but the best solution in each case should, of course, be sought. Until detailed plans for readjustments of land use in the Region are worked out, it will be impossible to determine whether or not a further considerable migration from the area can be avoided.

In a program of rural resettlement, provision should be made for full-time farming; part-time farming, with opportunity for off-the-farm employment; and in special cases, homes with garden plots for aged people.

7. *Compensation to Local Governments on Account of Federal Land Acquisition.*—It is important that appropriate provision be made to insure continuing revenue to local units of government in the Great Plains, in equitable amount from lands acquired by the Federal Government, insofar as such revenue can be made available from income yielded by the purchased lands. Local public revenues throughout much of the Great Plains area are inadequate. Much of the acreage now being acquired by the Federal Government has contributed substantially in taxes to the support of local government; loss of these taxes will aggravate fiscal problems already acute.

It has therefore proved difficult or impossible to obtain the cooperation of officials in various counties in securing tax-title lands for purposes of range control and administration. Situations exist in present acquisition projects in which workable plans for range administration are stalemated by the fact that county-owned (tax-title) lands, interspersed throughout the area, are withheld from the Government purchase program. As a result, neither the Federal lands nor the county lands can be properly controlled and administered. Fences cannot be constructed economically, and stock-water facilities are in some cases not accessible from purchased lands within natural grazing distance. At least one county is following the policy of selling its land on long-term contracts to resident stockmen for less than the sum offered by the Federal Government, for the sole reason that the land thereby will remain in the tax base and perhaps constitute a continuing source of tax revenue. This practice not only is creating impediments to effective range control, but also is intrenching the type of scattered settlement which is a basic cause of present fiscal problems, and the elimination of which constitutes one of the major objectives of the land-use adjustment program.

The conclusion is unavoidable that Congressional action granting authority to compensate local governments in areas of Federal land pur-

chase should accompany and be a part of any legislative enactment authorizing further land purchases. To this end it is recommended that, as a general principle of action, lands which may be acquired by the Federal Government in furtherance of the program for readjustments in land use in the Great Plains be subject, when productive of forest, grazing, or other income, to revenue-sharing provisions similar to those imposed upon the Federally-owned lands administered by the Grazing Division or the Forest Service.

Direct payment to existing minor jurisdictions would have several obvious disadvantages. In a sense they would endow, and tend to perpetuate against reorganization, many of the local units whose elimination is made desirable or necessary through the land-use adjustment program. Direct payments likely would be made on the basis of acreage purchased with little or no relation to future local need. Such payments might augment rather than offset present discrepancies between local units in the relation of revenues to needs. The alternative basis of distribution, i. e., taking into account relative local need, would be of doubtful feasibility for the Federal Government. These are questions better suited to determination by the respective States, and already are being so determined in many States where State aids to local government are highly developed. It is therefore recommended that the compensation plan adopted provide for payments to the State with amounts earmarked for the counties in which acquisition takes place, but leaving to the discretion of a State administrative agency the ultimate distribution among minor local units.

8. *Control of Destructive Insect Pests.*—Periodically sections of the Great Plains are ravaged by insect pests such as grasshoppers and mormon crickets, which destroy growing crops on large acres of arable and range land. A conservative estimate of the total loss resulting from such pests in the Great Plains area in 1934 is about $38,000,000. The periodicity of their reappearance depends on characteristics of the insects and on climatic conditions favorable to them. Measures of control of such pests—eradication if possible—should be part of any long-range rehabilitation program. It must be admitted that information on the ecological conditions, host plant associations and climatic stimuli favorable to the development of outbreaks is scanty, and that additional research is urgent. This research should be pursued intensively. However, without waiting for its ultimate findings, extensive complementary experiments in prevention should be initiated. What is now required is a new orientation in which we refuse to accept the necessity of outbreaks and devote our energies to prevention.

9. *Development of Other Resources: Lignite.*[4]—Serious consideration should be given to the possibility of development of other than agricultural resources of the Region as factors which may contribute to variety and stability of occupation and income. For example, gradual development of vast lignite deposits which underlie the northern part of the Great Plains area may be feasible. Supplementary to a program of conservation of oil and gas resources adjacent to the Plains area, development of these lignite deposits might be made to serve the Plains population and provide occupation.

This lignite fuel is suitable for combustion in boiler furnaces, production of gas for various manufactures, the plastic and allied industries, use as domestic fuel, and to a lesser degree, direct briquetting. The most promising early economic use, however, may be found in the generation of electricity, for use especially in connection with demands resulting from wider conservation and use of water resources. Lignite as a fuel for power generation has passed the experimental stage; it is used successfully in Russian and Australian generating plants, and

[4] From a memorandum contributed by Walter N. Polakov and Glenn B. Roloson of Works Progress Administration.

there are plants in western Canada and Texas.

It is suggested that investigations already made by the Bureau of Mines be pursued further, and that demonstration projects be established by a suitable agency, to prove or disprove the economic feasibility of the use of lignite in the generation of power.

II. Lines of State Action

A land of excessive risk in the past, the Great Plains could become a land of reasonable security in the future. However, if the change is to occur, the States, no less than the Federal Government, must act—and with understanding, courage, and promptness. It is recommended that the formulation of a program of Federal action along the lines which have been indicated, be conditioned by the extent to which necessary complementary action is effected by States, in accordance with the following suggestions.

1. *Surveys and Revisions of State Laws.*—Each of the States having territory in the Great Plains area should undertake promptly a survey, with a view to necessary revisions, of its present laws affecting land and water conservation and use, including those relating to agricultural institutions such as tenancy, leasing, taxation, and tax delinquency. In following sections of this chapter desirable new legislation along specific lines is discussed, and in the Supplement is presented a comprehensive analysis of legislation in the Great Plains States bearing on land and water use. Quoting from that chapter: "Four basic facts stand out clearly from the foregoing analysis. They are the lack of law, the lack of uniform laws, inadequate laws or administration, and conflicts of jurisdiction. This means that new trails will have to be blazed and adequate agencies established."

There are several reasons for thoroughgoing consideration by each State of the necessary legislation involved in a comprehensive program of land use, water use, and other readjusting measures. Laws, permissive and mandatory, are required to implement most of the measures recommended in this report; existing laws may remain as obstacles to achievement of the purposes of new specific legislation; although much of the necessary legislation probably should take the form of separate acts, these should be part of a program of acts so related that each reinforces the others; and inasmuch as the piling up of law on law is highly undesirable, all legislation relating to land and water use should be simplified and consolidated or codified.

2. *Zoning Land for Its Best Use.*—The legislatures of the several States in the Great Plains Region should pass enabling legislation under which their respective counties may zone land in terms of its proper use. The enabling acts should permit changes in the boundaries of the districts established within counties and in the regulations relating to them, but should establish safeguards against initial arrangements and later changes not carefully considered before adoption.

Zoning of land in the Great Plains is desirable for effective action and permanent results:

a. In periods of supernormal rainfall the opportunity to secure a good price for land may cause an owner to sell his holdings to a person interested in cash-crop production who is ignorant of the variability in rainfall and in crop yields. On the other hand, he himself may put in a crop, offset in greater or less degree an earlier loss, and then abandon the land to the detriment of his neighbors and the general public. An owner or operator may find it more profitable for a time, because of lower costs, to cultivate his land without protecting it from erosion by contour plowing, listing, terracing, strip cropping, or other appropriate means. Thus he destroys a natural resource, intensifies the siltation of streams, and otherwise damages the interests of the public. Zoning would insure proper land use, help to stabilize ownership, and promote the public interest.

b. Many farms consisting wholly or largely of poor land have been abandoned in the Great

Plains during the recent years of low prices and droughts. If the counties were promptly given authority to zone, they could prevent the undesirable reoccupation of much of this land in response to the stimulus of a year or two of heavier rainfall or of higher prices. Under such authority the county boards could establish grazing districts in areas which are clearly unsuitable for arable farming, and restrict the use of land for crop production. This would prevent the evil effects which result from attempts to farm poor land, including the depletion of soil and of grass cover; would diminish scattered settlement with resultant high cost of such facilities and services as roads and schools; would reduce the need for relief and seed loans; and would help to obviate various other detrimental effects of crop failure and low income.

c. In the Great Plains there are many areas in which livestock farming or livestock-and-grain farming is the proper use of the land. Under a zoning law a "livestock-farming district", for example, could be established where desirable to promote that system of farming. The regulations could provide that the cultivated land should bear a certain ratio to the number of livestock or to the number of acres of pasture available, or otherwise prevent the establishment of specialized cash-grain farming or other types of farming that would be undesirable.

d. The high costs of roads and schools in many parts of the Great Plains would be reduced if the pattern of settlement could be simplified and consolidated. Districts established in river valleys, along main highways, or in other suitable areas, would tend to concentrate farm residences and ranch headquarters and, in turn, would tend to reduce local governmental expenditures. To prevent settlement and attendant increase in school and road costs during a period of relatively abundant rainfall, new residences could be prohibited in the areas not suitable for permanent occupancy.

e. Zoning would help greatly to reduce speculative holding of land, which seriously retards the shifting of land from crop farming to a combination of crop and livestock farming or to grazing. The prices commonly asked are higher than anyone can afford to pay for land to be used in the more extensive ways. If all the land in a county were zoned for its various proper uses, the speculative holder might realize that his price was too high and might be willing to sell at a lower price.

f. Zoning would give stability and assure relative permanence to improvements brought about by other action programs. If there is no way to secure continuous use of land in the most desirable manner, as indicated by basic conditions, then the benefits of a program of range improvement, or of other conservation measures in which the public has invested, may be relatively transitory. The prevention through zoning of the occupation of land unsuited to farming would reduce considerably the amount of submarginal farm land that otherwise would have to be publicly acquired. Furthermore, zoning would add stability to a grazing-association program discussed in the following section, which, standing alone, could be no more permanent than its leases. In the case of privately owned lands, there could be no assurance without zoning that these leases could be renewed on terms that would make profitable or even possible the further use of the land for grazing purposes. If a year or two of heavy rainfall should precede the expiration of the leases, it is quite possible that some of the owners of the land might wreck the program by refusing to renew the leases on reasonable terms, if at all. Their hope would be that, as a result of the abnormal conditions, they could sell the land to unwary purchasers for crop production. However, if the land were zoned against crop farming, or if the extent of cropping were limited, the renewal of the leases would be more likely.

3. *Grazing Associations.*—One method of improving the conditions resulting from small holdings and the checkerboard-ownership pattern in the Great Plains is the establishment of

cooperative grazing associations. This method has been used with success in Montana,[5] but has not been extensively developed elsewhere. The other States of the Region should authorize, by appropriate legislation, the establishment of such associations.

A grazing association consists of farmers and stockmen who cooperate to control an area of range land which is held under several or many different ownerships. The association leases the land from the owners, determines the rules and regulations for its use, and distributes the grazing rights among its members. It is also an instrument through which the members can cooperate in many other ways; for example, in developing and improving the range by fencing and by the provision of water. It permits the use and development of an area as a unit and in effective connection with adjacent dry-farmed and irrigated land, thus making possible the fullest utilization of both range and farm land. Without such control, each stockman is in competition with every other stockman for the available range. Overgrazing, inflated values for strategic tracts of land, and other evils result.

Grazing associations are best adapted to those parts of the Great Plains where a considerable proportion of the land should be used for extensive grazing. It is difficult, but especially desirable, to establish an association and the desired control in areas where too large a proportion of the land is held in small tracts by absentee owners. However, public purchase and control of a sufficient number of such tracts, especially those most valuable for range use, might make practicable the formation of grazing associations where otherwise they would not be feasible.

Grazing associations make it possible to secure unified control over all the range land of a given area and offer to both public and private owners an agency for securing economical supervision of their land.

There should be a State agency to administer the grazing lands owned by the State and counties and it should have power to lease such lands to grazing associations. A function of such an agency should also be to encourage the formation of grazing associations and to assist them with their problems. The Montana State Grazing Commission fulfills these duties and in addition has the power to make certain rules and regulations. It should be the primary function of such an agency to see that the interests of the public in the range lands are adequately protected.

4. *Districts for Control of Erosion on Arable Lands.*—To a considerable extent wind erosion, and to some extent water erosion, is not limited in its destructive effects to the land on which it originates. This has led in some parts of the Great Plains to a movement for legislation permitting the formation of districts endowed with powers to prevent such methods of using arable land as will tend to injure the welfare of the community as a whole. Two of the ten Great Plains States have legislation of one or another kind providing directly for erosion control operations. Programs are now proceeding under Texas laws. All States of the Great Plains area should adopt appropriate legislation permitting the qualified property-tax-paying voters of a county or other area to form a soil conservation district. Attention is called here particularly to the suggested Standard State Soil Conservation Districts Law prepared jointly by the Land Policy Committee, the Soil Conservation Service, and the Office of the Solicitor in the United States Department of Agriculture. This law proposes that districts have the power to establish and administer erosion control demonstration projects and preventive measures; and to prescribe regulations, having the force of law within the district, designed to prevent and control erosion.[6]

5. *Tax Delinquent Range Lands.*—It is desirable that the several States provide promptly for the management of tax delinquent range lands under

[5] See Appendix 6.

[6] See Supplement, Memorandum III, and Appendix 7.

policies that will avoid their automatic resale to private individuals, and that will make them available for coordinated use with other public lands through cooperative grazing districts or other means.

6. *Facilitation of Needed Changes in Community Organization and Fiscal Arrangements.*—In general, existing permissive State legislation is adequate to provide for school-district consolidation, county high schools, and transportation of pupils; but in few places has desirable use of it been made. Laws providing for township dissolution and consolidation generally are appropriate, but county consolidation and optional forms of county government are provided for in fewer instances. Mandatory State laws or constitutional provisions governing county offices, salaries, and various functions, commonly prevent local internal economies. Unless consolidation or dissolution of local units accompany a land purchase and adjustment program, possible reductions in the cost of assessment, general bookkeeping, and administration are less likely than reductions in school and road costs. In the case of county government in particular, the possibilities of overhead cost reductions, and in many instances the prospects and practicability of consolidation, are likely to be overemphasized.

Although local units of government have not availed themselves largely of the opportunities provided by the permissive State legislation already enacted, consideration might well be given by most or all of the Great Plains States to the possibility and feasibility of stimulating or inducing needed changes in community organization and local fiscal arrangements.

7. *Problems of Taxation.*—The extent of tax delinquency and the consequent diminishing tax base throughout the Great Plains area suggest problems additional to the obvious one of widespread decline in farm incomes. While the levy and collection of taxes for maintenance of public services cannot be avoided, it may be that details of a system, such as modes of assessment and collection, have ceased to be suitable for the economic and social conditions which have developed. While in areas predominantly rural the property tax probably must remain a principal means of securing revenue, it is possible that assessments on valuations that vary with income, or on a fixed valuation that is normal over a long period of variable conditions, will conform more closely to economic reality and therefore be more collectible than assessments based on fixed valuations determined at a time of relatively abundant rainfall and also, possibly, of high prices. The States should give serious consideration to the nature, effects, and possible revision of their tax systems.[7]

8. *Water Resources and Water Problems.*—Action along several distinctive lines may well be taken by most or all of the States with a view to promoting the conservation and efficient use of water.

a. In those portions of the Great Plains in which there is in prospect an expansion of grazing activity outside of public grazing districts, or in which supplies of water for farm livestock are now inadequate, the responsibility for providing wells, farm ponds, small reservoirs, and the like, appears clearly to rest with individua farmers or groups of ranchers. Nevertheless, the States might aid by legislation that encourages stock-water improvements through tax reduction, as in Kansas, or through other means; by establishing and enforcing minimum standards of design and construction; by simplifying procedures for adjudicating rights to the water used; and by extending greater support to official State agencies equipped to give engineering and other technical advice to farmers and stockmen.

b. The development of irrigation projects, ranging in area from a few hundred to several thousand acres, would be facilitated by legislation establishing State agencies which, like the Montana State Water Conservation Board, could cooperate with Federal agencies and with

[7] See Supplement, Memorandum II.

groups of farmers in studying, planning, and financing new enterprises.

In the valleys of some of the larger rivers there are bottom lands and low benches with more or less fair-to-good land which might be irrigated advantageously by pumping unappropriated water from the rivers. There are numerous minor valleys and coulees in which storage of water on a moderate scale may be practicable for supplementary irrigation. The services of competent technicians are needed in testing and developing such possibilities.

c. The adaptation of highway construction to water conservation purposes is suggested. There is no question that highways must be well drained, but perhaps stressing the necessity for adequate drainage has led to extreme measures which cause highway drainage to become one of the principal wastes of water. The Committee is advised by the Bureau of Public Roads that "If it is desired to impound the water or retard its flow, or hold it as nearly as possible where it falls in an endeavor to have it absorbed into the ground to raise the ground-water level, highway design, particularly with respect to the smaller drainage structures, can be adapted to this procedure . . . provided some means is adopted for satisfying the adjacent property rights involved. . . . Generally speaking, except for certain types of soils of high capillarity, the maintenance of a free water level approximately three feet below the surface of the roadway would have but little effect on the ordinary stability of the road surface and the supporting sub-grade." In some instances a small amount of work, including diversion and dispersion along contours to avoid erosion, would permit water accumulating in roadside ditches to be turned into adjacent fields; in others small roadside reservoirs can be created by drop inlets or elbows and small semi-circular or rectangular box openings at culverts. At exceptionally favorable sites a road embankment can be made the wall of a substantial reservoir. The accompanying illustrations are suggestive.

d. Research and extension work on the irrigation of farm gardens with water from surface and underground sources should be promoted by the State agricultural colleges, and other agencies.

e. It is generally true in the Great Plains Region that legislation designed to safeguard the ground-water supply and to promote its orderly use is lacking, is inadequate, or is not enforced. Such conditions should be remedied promptly.

The attainment of two objectives is essential: first, control of the quantity of water which may be pumped by an individual appropriator; and second, a program for elimination of practices involving the waste of water. This would include such items as the capping of flowing wells, the plugging of leaking wells, and prevention of the use of excessive quantities of water per acre. It would be of material benefit if the appropriate State administrative agencies could and would restrict new permits for the withdrawal of ground water to lands of approved quality.

9. *Land Occupancy and Tenure.*—The great extent of tenancy, its institutional weaknesses, and the ill effects of the tenancy system upon land and people in the Great Plains have been noted in an earlier chapter.

The Great Plains Committee recognizes that present forms of land ownership and tenancy are in large measure responsible for much of the wastage of soil resources and the economic instability and insecurity prevalent in the Great Plains. However, since the President has designated a Special Committee on Tenancy, under the chairmanship of the Secretary of Agriculture, to consider the subject of tenancy in its nation-wide aspects, the Great Plains Committee refers readers to the discussions and recommendations of that Committee.

III. Importance of Local Action

The success of any long-time plan for essential readjustments in the economy of the Great Plains will depend in the final analysis upon local action, even more than upon Federal or

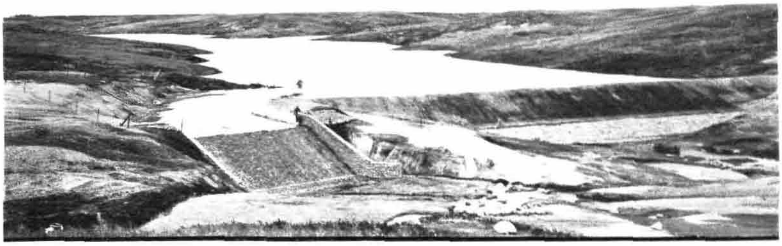

FIGURE 30.—*Retention dam in North Dakota. Where precipitation is scanty every drop should be conserved.* (Soil Conservation Service photo.)

FIGURE 31.—*Future barriers against the wind. In favorable localities trees will thrive on the Great Plains.* (Soil Conservation Service photo.)

FIGURE 32.—*Strip cropping retains water and protects the soil from wind.* (Soil Conservation Service photo.)

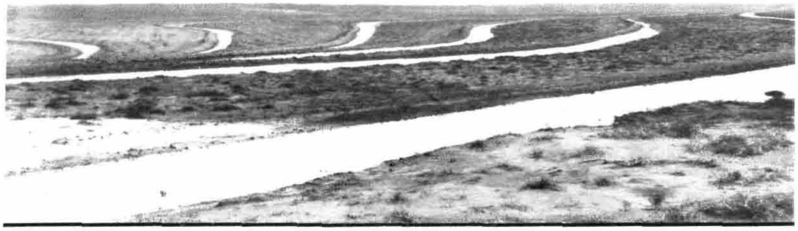

FIGURE 33.—*Terraces prevent run-off and erosion, store moisture, and increase yields.* (Soil Conservation Service photo.)

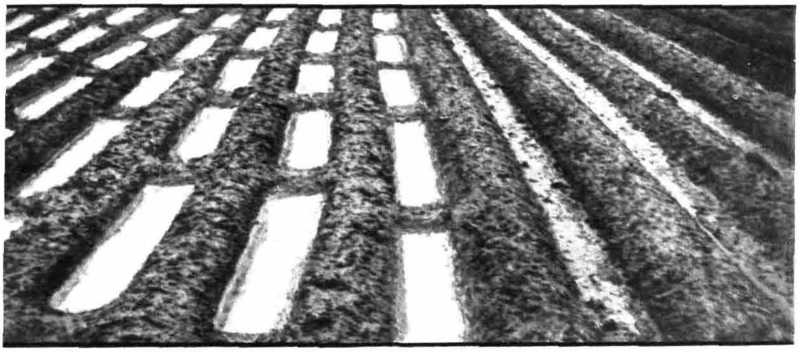

FIGURE 34.—*After a 3-inch rain. Basin listing at the left; open listing at the right.*

FIGURES 35 AND 36.—*Highway construction may be made to promote water conservation.* (Bureau of Public Roads photos.)

State action. This is true not only with respect to readjustments in farm organization and practices; it is true also with respect to the disposition and use of lands that have reverted to counties for non-payment of taxes, the zoning of lands, the organization and operation of grazing associations, the initiation and conduct of new irrigation ventures of moderate size, and adjustments in local government structure—crucial problems already discussed from the standpoint of associated Federal or State action.

Indeed, it may be repeated that the success or failure of a long-term program of readjustment and development for the Great Plains will depend chiefly on local attitudes, policies, and actions. This is as it should be. Federal agencies may advise, assist, coordinate, but State agencies and especially local agencies must largely determine their own destiny.

IV. Readjustments in Farm Organization and Practices

Most of the measures that have been recommended in preceding pages are designed to promote: (1) the conservation and efficient utilization of the natural resources which constitute the material bases of the civilization of the Region; (2) the development of a type of economy that will withstand the shocks of recurrent periods of severe and prolonged drought; and (3) the development and maintenance of the highest possible income and standard of living in the Region. The attainment of these associated objectives will necessitate various readjustments in prevailing farm organization and farm practice—readjustments indicated, for the most part, in preceding discussions and summarized in the following paragraphs.

1. *Many operating units must be enlarged*—although some may be reduced—to permit properly balanced use of the land. The proper size will vary with natural conditions and the type of farming involved.

2. *Major shifts in crop production are essential.*—In general, the requisite changes in the cropping system involve (1) reduction in the acreage of cash crops, notably wheat and cotton; and (2) increase in the acreage of pasture and of hay and other feed crops. Some increase in inter-tilled forage crops, notably grain sorghums in the South and corn in the North, is desirable as an accompaniment to the shift in pasture. In most of the areas now characterized by dry farming, an increase in livestock, concomitantly with the shift to pasture and feed crops, is proposed.

3. *Systematic provision of feed and seed reserves is necessary* for the stabilization of farm economy. During good years, reserves of feed and seed must be stored as a protection against the lean years which are sure to follow. The pit silo is an economical and effective device for assuring reserves of feed.

4. *Supplemental irrigation* may contribute to a balanced and stabilized farm economy, where a sufficient supply of water is available and other conditions are favorable. Even if the water is physically and legally available and there is good land to which it may be applied, the desirability of using it for the farm garden, for production of supplemental feed for farm stock, or for other purposes, will depend upon the relation between cost and benefits. In general, the requisite facilities should be inexpensive to construct and operate, since the economic returns will vary from year to year.

5. *The conservation of soil moisture and the protection of soil from erosion* are basic problems on farms throughout the vast Region; problems, the solution of which, year by year, is indispensable to the permanence of agriculture. Erosion-control measures for land in cultivation include such measures as (1) contour plowing, (2) contour listing and furrowing, (3) terracing, (4) contour strip-cropping, (5) rough tillage, (6) the leaving of high stubbles and crop residues in the surface soil, (7) summer fallow protected by broad strips along contours or at right angles to the wind, (8) the use of sweet clover in rotation, especially on sandy soils, and (9) the use of winter rye on sandy soils. "Water spreading", by which storm waters are permitted to

sink beneath the surface, is practicable in some sections.

6. *Alternative cropping plans,* both from the standpoint of soil protection and from that of crop yields, should be made to provide for unfavorable seasons, and last minute changes should be possible to meet variations in weather conditions and in soil moisture. "Dry land wheat yields go up as moisture goes down." The depth to which the soil is wet at seeding time should be a matter of vital concern to farmers; by this simple test they may determine roughly the chances for a good crop, the prospect of a heavy yield increasing with the depth of soil moisture. "Farmers who 'dust in' wheat, risk more than long-shot gamblers."

From the standpoint of soil protection, flexible cropping programs are even more important in the Southern Plains than in the North. In the South, and especially in sandy soils, the planting of grain sorghums in wide rows, either in strips or blocks, has been recommended as a substitute for fallow. The sorghum stalks tend to reduce blowing, as compared with fallow, and yet do not withdraw enough moisture to prevent this practice from serving the same purpose as fallow. The seeding of small grains, millets, and Sudan grass, to be used as annual pasture, also has been recommended for this section. Maintenance of cover on sandy land through the fall and winter, accompanied by fall and spring listing, is a further device for reducing wind erosion.

7. *Another primary need for water* on most of the farms, apart from household requirements, is for stock; and in general it will be increased by the changes in farm economy that are recommended. The problem of providing an augmented supply from springs, wells, ponds, or reservoirs will require consideration on thousands of holdings. Farmers should seek competent technical advice before arranging for the drilling of deep wells or undertaking the construction of small reservoirs.

8. *Windbreaks* should be planted where water and other conditions are favorable and also where they are needed to protect plants against the desiccating effects of hot, dry winds. Experience has indicated that the yield of crops is increased on fields so protected. Surplus wood will serve minor useful purposes. Moreover, trees and shrubs may be important factors in the comfort and attractiveness of farmsteads.

While the farm changes and practices just noted call for intelligent, determined action by the individual farmer, some of them are beyond his unaided power. Carefully planned, long-continued, integrated effort by all the agencies that have been repeatedly noted—Federal, State, local, and private—alone can bring high success. The time has come to recognize frankly not only the great natural assets of the Region but also its serious liabilities, and to substitute intelligent *adjustment* to nature for futile attempts to conquer her. This is a responsibility primarily of the people residing in the Great Plains States.

V. Organization for Readjustment and Development

The task of readjustment and development along the lines recommended in this report, is urgent. The type of coordinated action necessary for progress will come slowly and painfully if left to "the natural course of events." Uncoordinated action leading inevitably to that improper land use and further retrogression which our recommendations are intended to diminish, already has acquired considerable momentum. For instance, as illustrative of the rapidity with which excessive areas are given over to arable farming, in the current report of the Secretary of Agriculture we read: "Our wheat farmers continue to expand their acreage. The area seeded for the 1936 crop was 74,500,000 acres, the largest on record with the exception of that seeded in 1919." In the ten Great Plains States the total 1936 seeding of wheat was the largest on record. In this area there are

included many tracts which are not suitable for arable farming. In view of such circumstances, a definite implementation of the program here presented is imperative.

There are numerous governmental bureaus and other extra-departmental agencies which exercise functions of varying importance in relation to the readjustment of the economy of the Great Plains Region. A list of these Federal agencies includes the following:

A. Department of the Treasury:
    1. Bureau of Public Health.
B. War Department:
    1. Office of the Chief of Engineers.
C. Department of Justice:
    1. The Lands Division.
D. Post Office Department.
E. Department of the Interior:
    1. General Land Office.
    2. Office of Indian Affairs.
    3. Office of Education.
    4. Geological Survey.
    5. Bureau of Reclamation.
    6. National Park Service.
    7. Bureau of Mines.
    8. Division of Grazing.
F. Department of Agriculture:
    1. Office of Experiment Stations.
    2. Extension Service.
    3. Agricultural Adjustment Administration.
    4. Bureau of Agricultural Economics.
    5. Bureau of Agricultural Engineering.
    6. Bureau of Animal Industry.
    7. Bureau of Biological Survey.
    8. Bureau of Chemistry and Soils.
    9. Bureau of Dairy Industry.
    10. Forest Service.
    11. Bureau of Plant Industry.
    12. Bureau of Public Roads.
    13. Soil Conservation Service.
    14. Weather Bureau.
G. Interstate Commerce Commission.
H. Federal Reserve System.
I. Federal Housing Administration.
J. Federal Board of Survey and Maps.
K. Reconstruction Finance Corporation.
L. Federal Home Loan Bank Board.
M. Electric Home and Farm Authority.
N. Rural Electrification Administration.
O. Resettlement Administration.
P. National Youth Administration.
Q. Farm Credit Administration.
    1. Land Bank Division.
    2. Intermediate Credit Division.
    3. Production Credit Division.
    4. Cooperative Division.
    5. Regional Agricultural Credit Division.
    6. Emergency Crop and Feed Loan Section.
R. Federal Farm Mortgage Corporation.
S. Federal Emergency Administration of Public Works.
T. Federal Surplus Commodities Corporation.
U. Works Progress Administration.
V. Emergency Conservation Work.
W. Federal Deposit Insurance Corporation.
X. Commodity Credit Corporation.
Y. National Resources Committee.

To the foregoing must be added State, county, and municipal governments and numerous types of districts (conservation, irrigation, grazing, etc.) which have been or will be formed under the provisions of State laws.

Inasmuch as it will take a considerable period of time to improve conditions materially in the Great Plains, there is ample justification for setting up therein some continuing territorial agency having for its mission the promotion of readjustments of the many different kinds that have been discussed and which in total will make effective a salutary long-range program. There is in the Great Plains a sufficient uniformity as to problems to justify the creation of such an agency, either as a phase of comprehensive effort toward national planning and coordination, or as a separate entity.

The multiplicity and great variety of efforts now being put forth in this area, not only by the Federal Government but also by States, counties, and local communities, make coordination from Washington, as contrasted with coordination in the field, exceedingly difficult. Prompt, abiding, and effective integration can really be brought about only by adding supplementary horizontal coordination in the field. Such coordination is wholly consistent with modern ideas of management and administration, and will tend to strengthen rather than to weaken departmental and sectional authorities in their respective fields of activity.

An agency set up for this purpose should not displace existing agencies, nor should it assume any administrative control of the operations which those bodies normally carry on. Its proper field should be that of continuing study of the Great Plains problem as a whole, and of endeavoring, by consultation, education, persuasion, and guidance, to integrate the efforts of all forces concerned toward a common end.

The agency should be given authority to call on the various Federal agencies functioning in the Great Plains for such information as may be required to make field coordination effective. Any department of the Federal Government should be afforded the opportunity of designating a liaison officer to represent it in its relations with the proposed agency.

Among the duties of the suggested agency might well be:

a. To aid in effecting the closest possible coordination between Federal agencies and State and local agencies working toward the economic reorganization of the Great Plains;

b. To encourage all varieties of research of special interest to the Great Plains area, to collate and analyze available data relating to the area, and to procure directly such necessary supplemental data as existing agencies feel that they are not in a position to procure;

c. To coordinate the execution of the recommended program of land use mapping to the end that it shall be of the maximum utility to the various agencies whose work requires such mapping;

d. To follow educational efforts throughout the area which look toward the conservation of soil and water resources, to the end that such efforts may be made most effective;

e. To report annually, with recommendations as to Federal legislation bearing on the Great Plains, after appropriate consultation with administrative departments;

f. To recommend to States and local political subdivisions such legislation as is deemed advisable;

g. To perform such other functions as may be assigned to it from time to time.

In the light of the foregoing, and especially in view of the necessity for immediate and emphatic action, the conclusion is inescapable that the coordination of all the activities—Federal, State, local, and private—which are being directed toward the amelioration of conditions in the Great Plains, should be made at the earliest practicable moment the specific concern of some continuing agency, without other responsibility, and having its headquarters convenient to the Region.

In view of the studies now being made looking toward possible readjustments within and between executive branches of the Government, it seems unwise to recommend too definitely either how such a Great Plains coordinating agency should be composed or how it should be woven into the fabric of governmental administration. However, the proposed agency will require funds for its own administrative expenses. For this and other reasons, the prestige of ultimate Congressional sanction of its set-up and its long-range objectives seems both desirable and necessary.

The activities of the proposed agency as heretofore described should form, as soon as practicable, a part of the nation-wide effort toward better planning and greater coordination. But pending the time when such comprehensive national planning activity apart from Federal

administrative departments is provided for through Congressional action, and again having in mind the necessity for immediate and uninterrupted effort with respect to the Great Plains, the task might be assigned to some more or less temporary committee, council, or commission created by Executive Order, to encourage as best it may the development of the integrating influences already set in motion in the Great Plains area.

Public opinion throughout the Great Plains appears to be ripe for this step. In fact it has frequently been brought to our attention that the development of State and local conservation activities must largely wait for Federal leadership and tie in with Federal activities. It is also to be noted that the various agencies, both Federal and State, that are at work in this area, will welcome some general coordinated plan which will reduce overlaps to a minimum and make each move more effective because it has become a part of a common effort.

The economic drift in the Great Plains for years past has been steadily downward. If economic deterioration of the Great Plains Region, recently heightened as a result of the depression and drought, is to be stopped, it will be only because the Nation takes the situation in hand promptly, emphatically, and competently.

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FIGURE 38.—*The construction of reservoirs where water is available should be an important part of the Great Plains program.* (Resettlement Administration photo.)

FIGURE 37 (preceding page).—*Well-planned crop farming is an essential part of a balanced agricultural economy in the Great Plains.* (Resettlement Administration photo.)

Supplement

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MEMORANDA ON WAYS TO INSTITUTIONAL READJUSTMENTS

PREPARED FOR THE COMMITTEE

Memorandum I

CAPITAL AND CREDIT

The primary purpose of any readjustment of the financial situation in the Great Plains area should be progressive reduction, and elimination at the earliest practicable moment, of the necessity for grants and subsidies; substitution therefor of needed capital loans on a sound credit basis; and establishment of a sound credit basis—which means one which is safe for the borrower as well as for the lender—by bringing land use into conformity with the requirements imposed by fundamental climatic and other physical factors, and by market conditions. Financial reorganization along these lines is as much sound Regional policy as sound National policy; and it is gratifying to be able to report that this is the point of view held by the many leaders in the area whose judgments have been expressed to the Committee at hearings and otherwise.

The problem is essentially one of investment of capital for the purpose of effecting reorganization of land uses and of farm practices in such manner as to increase the income-earning capacity of agriculture in the Great Plains Region. The interest and principal of loans must be repaid out of earnings, and therefore earning capacity determines their soundness. In the recent past, three major factors have affected the soundness of loans and investments in the Great Plains area: (1) the decline of the general price level of agricultural commodities; (2) the great variability in crop yields; and (3) the fictitious values attributed to much of the land during periods of intense speculation. The first of these factors is a national agricultural problem outside the field of this report. The second is a factor reflecting natural conditions outside the control of man; but these are conditions to which man can make adjustments that will affect favorably the quantity and flow of agricultural income. The third factor is definitely although not easily within the control of man, and should be managed accordingly.

Such adjustment of the financial situation places on the States concerned, and on individual citizens, a heavy responsibility for effective cooperative action of the nature indicated in the Committee's Report. The Federal Government is the only agency able to mobilize capital when its procurement through ordinary private channels is prevented by depressed economic conditions, and to take action looking towards stabilization of the price level and elimination of speculative prices; but whatever it may do will not have complete effect in establishing sound credit conditions unless the States, through indicated legislative and administrative action, and individuals, through the will to improve their operations, create locally those conditions of land use and farming practices that both conserve the soil assets and procure a stable income from their use.

The Need of Capital

It is obvious that any thorough-going program of readjustment and development, such as has been outlined in the Committee's Report, will require considerable new capital. Reorgani-

zation of land use, so that each parcel is employed for the purpose for which it is most suitable and which will give it the maximum income-producing value, will require purchases by the Federal Government and by State governments. The blocking up of tracts for most efficient operating use, and the development generally of family-sized holdings, will require purchases both by governments and by individuals. Restoration of land and other properties that have been injured by erosion and by misuse; the reestablishment of herds that have been depleted by starvation and forced sales; and the initiation of measures for prevention of erosion generally—these will require the application of new capital, which may be considered an investment for enlargement of the assets of the Region. New capital also will be required for what is more in the nature of working capital: the initiation of new farm practices—seeding of cultivated land for pasture; seeding of forage crops; establishment of forage reserves; making cropping plans in accordance with soil-moisture indicators, which will require working capital to tide over an unfavorable season; and so on. Insofar as measures are taken for conservation of water resources—such as stock-watering ponds and small irrigation projects—a considerable amount of capital will be required.

Sources of Capital

The capital resources of the Region have been seriously depleted during the recent years of drought and depression. The "financial water table" has been lowered. Although increasing deposits and bank reserves indicate improvement in conditions in the Plains, there is little likelihood that the Region by itself will be able to contribute greatly to the capital requirements for a general program of rehabilitation and development. The bulk of the capital must come from outside.

This need should be looked upon as a matter of national concern. The Region is a source of supply for foods and other materials. It is also a great market. Its economy has been interwoven into the economy of the Nation. These lines of economic interrelation must be maintained in full vigor. Outside capital has a self-interest as well as a public responsibility in maintaining them.

All possible reliance should be placed on private sources of capital, and lending by them should be encouraged; but, although the Farm Credit Administration reports that private lenders are returning to the farm mortgage loan field generally throughout the United States—the increase from 1934 to 1935 in the estimated amount of farm mortgages recorded was 27 percent [1]—it is probable that a considerable time will elapse before the Great Plains area will invite renewed interest by private lenders to any consequential degree. Although the proportion of these loans held by life insurance companies, commercial banks, and private investors has declined while that held by the Federal land banks and the Land Bank Commissioner has increased so that these public agencies hold a larger proportion than any other single lending institution; nevertheless, the private lenders still are heavily loaded with delinquent mortgages of the Region, and with real estate from foreclosures and defaults.

In one respect this hesitation of private lenders in the long run may be beneficial. It may give time for the establishment of new lending standards. It was outside capital which built up the economy of the Great Plains Region, but also it was the lending without foresight of this private capital that is in large part responsible for rapid and destructive developments of land use. When private capital again becomes interested intensively in this market, it should be on the basis of an understanding of fundamental physical conditions and in the light of a definite program of rehabilitation, in order that errors of the past may not be repeated.

Since apparently neither the Region itself nor

[1] Third Annual Report, 1935, p. 9.

outside private interests can be relied upon for any large amount of capital to assist in carrying out a readjustment program that should be begun immediately, the mobilization of capital resources becomes both a responsibility and an opportunity of the Federal Government. As an opportunity, credit uses can be controlled in accordance with a definite policy and program; many of the abuses and unwise speculative practices, which were encouraged or made possible in the past by the uncoordinated extension of credit, can be avoided; and a new pattern can be created.

The Present Credit Situation

The breakdown of the credit mechanism in the Great Plains was discussed in Chapter IV of the Report. It is not necessary again to emphasize the gravity of the present financial situation. The problem falls into three parts: (1) the adjustment of existing debts; (2) the meeting of the normal credit demand; and (3) the provision of additional credit for new undertakings.

In the past, Federal emergency assistance has been extended in the form of Land Bank Commissioner loans, drought relief loans, emergency crop and feed loans, conservation loans, and similar types of credit. It is to be expected that with the passing of the depression, many of these emergency loans will be liquidated. Further scaling down of debts in many cases may be necessary, but resulting losses should be so distributed as to be tolerable for creditors and debtors alike. The Farm Credit Administration is an agency through which part of the existing difficulties may be resolved.

Sound normal credit demands in the Great Plains can be met in part by the commercial banks of the Region and other non-governmental institutions. To supplement their resources are the land banks, the intermediate credit banks, the production credit corporations and associations, and banks for cooperatives.

Principal concern, however, is not so much with the settlement of existing debts or the provision of normal credits, as with a financial plan to bring about a permanent readjustment within the area with the final goal of making the Region essentially self-supporting.

A Long-Time Policy

The existing financial status has, of course, a direct bearing upon the execution of any plan for the future. It is desirable to encourage individuals and associations of farmers to take as active a part as possible in any program of readjustment. But one of the limitations upon the efforts of individuals, singly or in association, is lack of available capital. Those farmers who now cannot secure mortgage credit through the Farm Credit Administration, have little capital of their own to invest.

Under such circumstances a program for advancement of credit to the present or prospective farmer for the purchase of land would have little applicability unless present credit policies were modified. The capital required to put through a program of public purchase and sale or lease of farms and farm land would be practically the same as under a credit program designed to promote a reorganization of farming units by individual borrowers. However, the latter would put upon the farmer the initiative of securing the land and carrying on the negotiations, and the costs of the transaction would be borne directly by him. These factors might increase greatly the difficulty of carrying out a coordinated plan of land utilization. In consequence, any extensions of credit even under modified loan policies should be thoroughly integrated into the general plan.

Terms of Payment.—There are a number of points to be considered in connection with any program that is intended to provide more than 75 percent of the capital required for the purchase of a farm, or even 75 percent, as authorized by the Farm Credit Act of 1935. Farm lands long have been considered relatively safe investments, and the income usually is capital-

ized at a low rate of interest. However, low interest charges are of little help to a farmer when they encourage the contraction of a large volume of debt. It is not interest payments alone which constitute a debt burden, but interest and principal repayments combined. Long-time contracts, making possible a low rate of amortization, would promote ownership. In this way, the total annual payments which a farmer is required to make can be kept within reasonable limits and in line with the income which the land may be expected to yield without exploitation. The costs of administration and servicing, and the loss of an occasional loan might well be considered as a national investment in rehabilitation and soil conservation, justifiable as a social good. The heavy debt burdens of the past frequently have forced farmers to disregard the long-run probability of land exhaustion in order to secure immediate profits. By relieving this pressure through the absorption for a period of some of the costs of credit, the country stands to benefit by the conservation of the land resources.

There is one important limitation to a program designed to bring about proper-sized operating units, through advancing credit or through the purchase and resale of land. Neither method provides for sufficient future flexibility in the size of the farm; a flexibility which should be greater than in the past. This flexibility may become desirable because of changes either in the general economic situation or in the circumstances affecting the family operating the farm or ranch. Such elasticity can be achieved best by a program of public acquisition of land and its lease to those who need additional acreage.

Short and Intermediate Credit.—The farmers who intend to increase the size of their operations, or otherwise reorganize their farms in a better land-use program, also will need short-term and intermediate credit. The Farm Credit Administration provides such credit. But, as with mortgage credit, many of those who will need short and intermediate credit will not be eligible, at least for some years, to borrow under the prevailing "hard-loan" policy from the established credit agencies. Such loans should be made available in some manner where they are needed to further a program of readjustment. The current rural rehabilitation program shows that much can be done through advancing credit based on sound farm plans. Conditional loans could be made one of the most powerful forces making for conservation. However, such loans at present encounter the difficulty of reluctance of local courts to penalize for any breach of contract other than failure to pay interest and principal when due. Credit which would assist the farmers in carrying surplus feed from years of good to years of poor crops, would do much to stabilize agriculture and promote family-sized farms in the Great Plains. Credit advanced for this or any similar purpose should be coordinated carefully with a program for advancing mortgage credit, and with the other steps taken to bring about a readjustment in land use.

Credit to States and Local Units of Government.—The cooperation of the States and local communities is essential in the development of a land-use program for the Great Plains. Federal, State, and local cooperation now is carried on in many related lines of activity. For example, the Fulmer Act provides for Federal-State cooperation in the establishment of State forests. Under this Act, the Federal Government purchases the land and sells it to the State on a long-time contract. The State must agree to manage the land in a manner approved by the Forest Service and reimburse the Federal Government out of the income derived from the land. A similar program might be established for grazing areas, and perhaps for other lands. Such a program could begin by advancing funds to the States for purchasing from the counties approved tax-delinquent lands suitable only for grazing.

The cooperative work of the Forest Service has stimulated the establishment of efficient State departments of forestry. A cooperative program on

grazing, and perhaps on arable lands, not only those which would be secured by the tax-delinquency route, but lands already in the States' hands—should be promoted by an appropriate credit agency. In many ways such an agency could perform valuable services in establishing better use of a State's grazing resources. It might well be the same agency which promotes and assists grazing associations.

Assistance also might be extended to local governmental units to facilitate a program of consolidation or elimination of overlapping functions. The occasion for Federal cooperation in such activities would arise in the course of Federal acquisition of land and of resettling families.

Credit to Cooperative Groups.—Loans for the purchase of land might be provided to cooperative groups under certain circumstances. For instance, a grazing association may be able to secure more effective control by purchasing rather than by leasing lands from private individuals. One of the Montana associations, it is said, is willing to advance 25 percent of the funds needed, if it can secure a loan for the balance, to purchase certain lands within the district where it operates.

The readjustments brought about by changes in the use of land benefit not only the farmers or ranchmen immediately concerned, but also the community of which they are a part by increasing the incomes of the local business men and the tax revenues of the local governmental units. The loan of a portion of the necessary funds to a local association which would carry on a program of farm consolidation or enlargement, might be made a means for securing local financial participation and active responsibility for the program. There may be other ways in which local associations could operate, and opportunity should be left open for such cooperation.

Grants to Promote Soil-Conserving Practices.—The Agricultural Adjustment Administration makes payments to encourage certain soil-conserving and soil-building practices. These include the shifting of land from soil-depleting to soil-conserving crops; the planting of legumes and grasses; terracing, listing, contour furrowing, and strip cropping on arable land; the development of water holes and wells, fencing, and establishing fireguards on range land. The Soil Conservation Service has rendered much technical erosion-control assistance to farmers. On its demonstrational projects the cooperating farmers have received in addition to technical guidance some materials and much labor provided by the Civilian Conservation Corps and relief agencies.

These programs bring capital into the afflicted areas—increase the store of permanent capital—and should be continued and expanded. The projects of the Soil Conservation Service are effective demonstrations of methods of soil conservation. It is not enough, however, to show farmers how to control erosion and conserve soil fertility; they must be assisted in putting this knowledge into practical application. A program for making technical service and the use of machinery and equipment available, and payments for certain practices, should be extended to all areas where soil erosion should be controlled in the public interest. There are instances where it is desirable to extend the soil-conserving and soil-building practices beyond the point covered by the present program. Funds should be made available for these extra payments.

There is the danger that payments which are not sufficient to solve the problem completely may prolong the evils associated with certain types of land use. Farmers may continue to keep land in crop production or in soil-depleting crops which would have been abandoned otherwise. To correct this situation, it should be modified to make it more flexible and adaptable to the needs of each farm. There should be complete coordination of any program of land conservation and retirement with one for the reorganization of the size of operating units and utilization of land in accordance with a classification scheme.

Final Goal to Build up Income.—All such measures are aids to building up the capital resources of the Great Plains. The provision of capital through the extension of credit in various forms is a vital part of any readjustment program. But this is only a means to an end—the increase and stabilization of income as an assurance of a reasonable standard of living. Through credit a new pattern of land use and of institutional organization in the Region can be brought about, but it can be applied with safety to borrower and lender only in accordance with a comprehensive, long-time program designed to promote a steady, even flow of income large enough to permit a decent level of living. Credit may be, indeed, the means of welding together all parts of a broad, long-time plan to bring about permanent rehabilitation.

Memorandum II

TAXATION

Progressive increase in both amount and extent of tax delinquency in the Great Plains Region has been described in a preceding chapter. Chronic tax delinquency has become characteristic of large areas in the Great Plains. One of the most certain effects of delinquency is more delinquency and further decline in revenues available for the operations of government. The continued shrinkage in the tax base because of forfeitures of title, the decline in arable area, and the decrease in the value of lands, has pyramided the burdens of government upon fewer taxpayers and forced additional arrears and mounting distress.

The Rural Tax Problem

The pressing tax problems of the Great Plains Region center squarely on the prevailing system of property taxes. From the days of early settlement to the present, the States and their subdivisions have relied financially on the property tax. As the Plains area is predominantly a rural Region, there are few taxable resources other than agricultural real estate, and the property owner is assumed to benefit from public services in proportion to his holdings.

It is only to be expected that a system of tax assessments which do not vary in proportion to farm incomes would produce delinquencies during periods of drought and depression. However, when tax delinquency develops to the point of wholesale foreclosures and moratoria, its very scope and extent may be considered as prima facie evidence of underlying economic and political maladjustments. The breakdown in local government finances and in public services should be considered as adequate warning that the widening gap between public revenues and expenditures is not a temporary phenomenon. The causes of this divergence extend beyond any cyclical variation of rainfall into the fundamentals of uneconomic organization of government, improper utilization of property, and excessive reliance on and ineffective administration of the property tax.

Many activities of local governments have been maintained, and the governments themselves kept from disintegrating, by emergency loans and grants. However, governments cannot satisfactorily endure on subsidy. Nor will any policy of compulsion and penalties wring taxes from non-revenue producing lands. An orderly readjustment surely would involve fewer hardships than community collapse and disintegration, even though the readjustment necessitates important changes in the organization and financing of local governments.

Reorganization of Local Government

One approach to the problem of reducing the absolute burden of taxation is reorganization of local governmental units and reallocation of their functions to eliminate unnecessary expenditures and to increase the effectiveness of necessary expenditures. Any reduction in total costs reduces the need for revenues, while more effective expenditures provide more and better services at a lower per-unit cost. "The solution does not rest in providing 'cheaper' govern-

ment, but in providing better and more efficient government." [1]

The cost of local government is excessively high in many sections because it is obsolete in both organization and function. The number, size, and character of local governmental units were developed under economic and political conditions which no longer exist. Counties whose size was based on the distance a horse could travel in a day, and school districts based on the distance a child could walk, have little reality under conditions of other, more rapid forms of transportation. Some of the local governmental patterns of the Great Plains did not even have historical basis, but were erected on expectations and hopes which never materialized. During the period of rapid expansion of wheat production and influx of population, "towns were organized; school districts were created; counties were divided; road and highway districts came into being; new local taxing bodies were initiated on every hand. Thus there developed a local government pattern designed to serve a relatively dense population. That it was expensive mattered little during the boom days. Bond issues were easy to float." [1]

In the same local area are to be found many separate boards, commissions, townships, districts, counties, and other layers of government, each with taxing power and working independently of the others. This multiplicity of governments, involving needless duplication and overlapping of functions and diffusion of responsibility, represents a perpetuation of a political structure that is out of harmony with present and potential economic organization.

To consolidate some of these governmental units, abolish others, and redistribute the functions of still others would provide economies and promote genuine self-government. In some very sparsely settled sections the complete elimination of certain local governments would be desirable. "A section of about 10 million acres in northern Maine gets along very well without organized local government. Property in that section enjoys moderate taxes, paid directly to the State. The few residents get the benefit of all essential governmental services, provided in large part directly by State agencies. The remainder of the State is in the happy position of not being obliged to pay taxes to help support the sparsely settled section as is generally required in other States, where such sections have the ordinary forms of local government." [2]

The zoning of land by counties, or even by the States, not only would promote the better utilization of the natural resources, but also would do much to reduce the cost of local government and improve the quality of public services. Such public control would concentrate settlements on the more arable lands, and would permit schools and roads to be eliminated in districts where the cost of their maintenance is now excessive. The agricultural community would become more closely knit, with government services on a low unit-cost basis and with a minimum of unwisely used land inviting tax delinquency. Both in size and function, the unit of government can be adapted to the utilization of land with substantial reductions in fiscal burdens.

In addition to the economies and efficiencies to be derived from reorganization of local governments, the necessary public functions could be performed more effectively if the techniques and instrumentalities of administration which have been developed by private enterprise and applied by some public enterprises were more generally utilized. In particular, every governmental unit should have a budget, a financial program which takes into consideration planned and probable income and outgo related to the functions to be performed and the work accomplished. A budget implies more than merely balancing total income with total expenditures;

[1] *The Western Range*, p. 243. [2] *The Forest-Tax Problem and Its Solution Summarized*, U. S. Department of Agriculture, Circular No. 358, p. 9.

it should seek to determine normal income according to sources, allocate income according to need, and measure expenditures according to benefits. Merely because many public services are not sold at a price, does not warrant the consideration of public expenditures as non-measurable costs unrelated to work performed and to benefits produced. "Your money's worth" applies to public as well as to private enterprise.

Many local governments could profit through improved financial practices and fiscal controls. Taxpayers have suffered frequently in the past because communities abused their credit privileges, relied on refunding instead of amortizing indebtedness, depleted sinking funds, paid excessive interest rates, and kept inadequate records. It may be that the States should provide uniform systems of accounts for their subdivisions, with periodic State audits. A larger degree of State supervision and guidance, which would provide more effective operating standards and procedures, should strengthen local government rather than weaken home rule. "To the extent that the State helps assemble reliable statistical data or furnishes expert advice, it is bolstering up local self-government rather than interfering with it."[3]

If changes involve new costs, such costs should not necessarily be considered as additional burdens. One must also look to the offsetting resultant saving in other costs. Expenditures which result in net gains in efficiency and responsibility will be reflected in reduced total costs or in greater service at the same costs. Only through performance will the prerogatives of local self-government be preserved.

Improvement in the Administration and Operation of the Property Tax

In areas predominantly rural, it is probable that some form of the property tax must remain a principal means of securing revenues for government. It is most important, therefore, that the operation and administration of the property tax be improved for reasons of equity and efficiency.

Revision and refinement of the assessment procedure are basic for an economically sound application of the property tax. Although theoretically the tax on land is based on its productive capacity, the generally prevailing practices of assessment are characterized by rule-of-thumb procedure far removed from economic reality. Range lands, for example, usually are grouped in one or two valuation classes, "and the poorer land must support a tax per animal unit of grazing capacity many times greater than the better lands within the same valuation class. In some counties a uniform tax of 5 cents per acre is assessed on all range lands, whereas, based on grazing capacity a tax ranging from 2 to 10 cents per acre would be more equitable. The operator whose range will support only one animal year-long for each 100 acres, pays a tax of $5 for each animal unit, whereas the operator on range which will carry one animal for each 20 acres pays only $1."[4]

Overvaluation and overassessment are common even when based on the actual selling values of land because of the influence of speculation. During the period of boom and development, much of the land of the Great Plains had a selling value not related to the average income of the land. Valuation frequently was based less on income than on hope; on hope which was but illusion in regard to the future. The illusion was crystallized by establishing artificially high tax bases. Today, many of these lands are overassessed because there never was income available to support the inflated structures.

There has been generally failure to develop and use land surveys and land classification studies of productivity in determining tax valuations. All the approved scientific methods and aids—including maps, surveys, sales records, produc-

[3] *Forest Taxation in the United States*, U. S. Department of Agriculture, Miscellaneous Publication, No. 218, p. 338. [4] *The Western Range*, p. 413.

tivity studies, and farm accounts—should be utilized to arrive at sound assessment values. Objective measures should replace blind judgment. Then, and only then, will it be possible to assess property at its equitable value.

Although the first requisite of an assessment system is an equitable determination of value, adjustments in application of the property tax may be made to produce better utilization of land. Taxes have economic consequences; the property tax may promote beneficial land utilization as well as raise immediate revenue, and in so doing it may create potentialities of greater future revenue. The taxing power may well be used to penalize the land exploiter who fails to conserve his soils and whose malpractices harm the property of his neighbors. Prevailing tax methods too often penalize the creative farmer.

Fire-insurance companies, in appraising property for the establishment of rates, have wisely developed procedures which give weights to elements of risk according to standards based on experience. They may set a base rate for a community, and then derive a rate for each particular property in the community by additions to and subtractions from the base rate, of values accorded items representing more or less favorable risk factors pertaining to the particular property. It is not impossible that comparable methods of differential taxation can be devised which would penalize the man who fails to conserve his resources and reward the man who follows accepted standards of land use and farm practice.

Differential taxes as a means of securing coordinated conservation practices on the farm seem to be a proper complement to zoning. A system of property taxation should serve to protect the public and long-run private interests by supplying a comprehensive incentive to conserve and build up the land. Where misuse continues, both the private landowner and the public eventually pay the bill.

Present local and State governmental machinery makes no provision for the rehabilitation and utilization of tax reverted land. "In general, existing tax-delinquency laws are based on the premise that only as a last resort will local government assert title for nonpayment of taxes. The assumption is implicit that any lands having once passed to private ownership have thereby proved their fitness for that status; that if local government is compelled to assert title as a means of collecting taxes it is merely a temporary phase of ownership pending prompt sale to a private owner." [6]

In most States, if property taxes remain unpaid the land passes to the counties or remains as "no man's land" until sold. A new public domain in county ownership is being created on the Great Plains. However, because of the pressure for revenue or because State laws require it, reverted lands are offered for sale to the highest bidder—only soon to revert again for the nonpayment of taxes. This shifting of land between county and private ownership only hastens and encourages the depletion of an already abused resource. Government, by taking no recognition of the true income-producing capacity, becomes an active agent in encouraging improper use and abuse of delinquent and reverted property.

The very process of repeated and persistent tax delinquency and reversion may be taken as evidence that the lands are not adapted to private ownership. If land cannot be maintained under private ownership, the sooner it comes under public administration and management, the better for all. A vital need in the Great Plains States, and elsewhere, is the creation of machinery so that title may be promptly asserted, not by the county, which is not a suitable agency for efficient management in a coordinated system of land use, but by the State, which can make provisions to satisfy the county's equity.

Once ownership has been established, the State, on the basis of careful land classification, should proceed to put reverted lands to their

[6] *The Western Range*, p. 545.

most economic use. Professional management should be provided by State agencies. And should it be desirable to exchange or acquire lands from the Federal Government in order to consolidate State areas, the State should have the power of so doing.

It seems to be a short-sighted and incomplete policy to make provision merely for improvement of the tax collecting functions of local government without providing for the foreclosure and management functions. The State should provide the appropriate means for handling economically, and in accord with a utilization program, the lands which have reverted to the State.

If the procedure of assessment, tax determination, and management of foreclosed lands is to be improved, it is recognized that changes must be made in the organization of local government. Assessment probably should be centralized under the control of jurisdictions of sufficient size to support full-time, well-paid assessors. It is well to emphasize again that cheap government is not economical government.

Revision of the Tax System

Even granting improvements in local government and in the property tax, it seems improbable that the property tax alone is sufficient to provide equitably the revenues required for needed public services. Unlike some taxes levied elsewhere, taxes on farm property are not easily shifted. It is probable that in some communities, despite proper land use, the property taxes alone would be burdensome and inequitable. In such cases, and in others as well, tax revision to secure a more equitable distribution in accordance with a reasonable interpretation of the "ability to pay" principle is desirable. "Such revision must rest upon the principle that personal income is a practical measure of ability to pay and that every citizen having taxable capacity should contribute to the support of the government under which he lives and from which he derives daily benefits."[8]

A great variety of taxes have been levied within the past few years on the basis of expediency. In order to continue the maintenance of basic public services it has been necessary to obtain revenue from sources heretofore untouched. It may be that some of these new sources of revenue should be studied and continued. It seems in the interest of public policy that every citizen should contribute something, if only a little, to the support of his State and local governments.

The field of income taxation for agriculture remains largely unexplored. It is perhaps more possible to determine with reasonable accuracy gross and net annual income than to determine capital value. A tax on net farm income, for example, would reduce the burden on the heavily mortgaged owner-operator. The present property tax is levied on the total property owned regardless of the amount of indebtedness which may be outstanding, and hence of the amount of equity the operator actually possesses. Studies show that farmers in many States have, on the average, only 30 percent to 40 percent equity in their farms. The justice of taxing equally a farm with a hundred percent of the equity belonging to the owner and another farm with only 30 percent equity belonging to him, is questionable.

The fact that a part—frequently a large part—of the farm income goes to persons living in towns and cities of the State does not present an insuperable obstacle to rural income taxation. When many of them live outside the State the problem is difficult. Perhaps eventually an integrated system of State and Federal income taxation may provide the collecting mechanism. The apportionment of revenues collected according to areas of origin is a problem in the relatively untouched field of social accountancy. It would be unreasonable to expect that all communities should have the same quality and amount of public services, for comparative

[8] Eric Englund, "Changes in Taxation Requisite for a Sound Program of Land Utilization"; *Proceedings of the National Conference on Land Utilization, 1931.*

advantages must be recognized. On the other hand, all communities have a right to a proportionate share, in accordance with an accepted principle of distribution, of the income produced within their confines. The equalization of taxation through the disclosure of incomes would avoid both the dangers of excessive subsidies and of unwarranted contributions as between levels of government.

In any system of income taxation, however, it should be recognized that the soil is a part of the farmer's physical capital which requires maintenance expenditures. The costs of keeping this capital unimpaired are to the farmer what depreciation of machinery is to the industrialist, and money spent for conservation should be deductible from gross income. Such an accounting would be an economically sound incentive to the maintenance of soil resources.

Another field of taxation deserving consideration is that of capital gains or unearned increments. Increases in the value of property in excess of improvements actually made are closely allied to speculation and the incurrence of nonproductive indebtedness. Past experience indicates forcibly that real estate speculation is not consistent with security of tenure and income. If it seems more desirable to have security of working capital and stability of income than fluctuations in land prices, the taxation of capital gains is one method of approach.

The entire problem of rural taxation and local government is one which offers an opportunity for constructive study and experiment. Inherited systems seem ill-adapted to provide for the operation and administration of services and public enterprises which have become an inherent part of modern society. The problem can be solved if it is studied as a technical problem in social income and cost accounting. The rate of solution, however, will depend on how desirous we are of improving our position. The need of restoration and development of the economy of the Great Plains area may well be the incentive that will lead to constructive experiments in reorganization of rural tax systems.

Memorandum III

LEGAL PROBLEMS

It is important that an outline be given of the legal problems that confront a comprehensive program of readjustment and development of the Great Plains economy. However, of necessity only the main outlines of the legal problems in this vast field of State and Federal law can be indicated. What is desirable is less an encyclopedic cataloging of the endless imperfections and varieties of laws and procedures, than a chart of the main tendencies and deficiencies, and an indication of possible suggestive patterns that may serve as a guide for future land and water utilization legislation.[1]

Soil Erosion Control

1. *Relation to Other Problems.*—Numerous related problems—administrative, social, political, economic, institutional—need to be resolved in establishing a program of State-wide erosion control.

a. Erosion is so closely related to farm management and land-use practices that the mere construction of terraces and check dams alone is not adequate to control erosion. The legislative program should encourage also modification of those land-use and cropping practices which are undesirable.

b. Failure of certain farmers to control erosion on their lands can cause washing and blowing of their soil onto other lands, thus making erosion control on other lands difficult, if not impossible. Consequently, legislation should embrace in its erosion control operations all lands that are affected in the specified area.

c. To be effective, such a program modifying land uses must have the understanding and sympathetic cooperation of the farmers. Therefore legislation should provide for voluntary cooperation of the majority at the same time that it provides for compliance by the objecting few.

d. Formulation of local programs and their execution may well be lodged largely with the farmers themselves; but at the same time expert guidance in formulating and executing plans should be made available.

e. The greater part of the income of all the citizens in the Great Plains Region is dependent upon continuous success of its farm production. Therefore, the general welfare of all the citizens of a State is enhanced by erosion control programs. Legislation should provide that the costs of operations should not be borne wholly by the owners of farm and grazing lands. It should provide that the costs be distributed in an equitable manner among all beneficiaries.

2. *Existing Legislation.*—Adequate State legislation for a State-wide program of erosion control on private lands is lacking in each of the Great Plains States.

a. State Legislation.—Of the ten Plains States, only three—Kansas, Texas, and Oklahoma—have adopted legislation providing directly for

[1] While the appendices contain present desirable laws or suggestive models, this highly condensed memorandum aims only to afford a general view of conservation's legal problems. A more complete analysis, prepared for the Committee, on which this chapter is based, may be consulted by State and Federal legal staffs drafting legislation.

erosion control operations. The Kansas law has been held unconstitutional by its Supreme Court.

There are two Texas soil erosion control laws. The first [2] authorized commissioner's courts to contract with landowners to construct such improvements as farm terraces, dikes, ditches, and water reservoirs, and other soil and water conservation and erosion prevention devices. Improvement costs are assessed on landowners not to exceed actual labor, material and fuel costs, no charge being made for depreciation or other expenses. Assessments remain a lien against such lands. The Board of Directors of the Texas Agricultural and Mechanical College is directed to formulate erosion prevention plans, to accept grants and services from any Federal agency, and to allocate them among the county commissioner's courts. No erosion control work can be done unless the owner of the land desires it. Costs are assumed by individual landowners, even though loans are available. Comparatively little has been done under this law.

The second Texas law [3] in part duplicates the first, but does not repeal it. The first Act deals with water and wind erosion, the second with wind erosion only.

Under the latter Act, when fifty qualified property-tax-paying voters petition, any county commissioner's court calls an election to ascertain whether a majority favors the county area-incorporation of a wind erosion conservation district. If it does, the county judge declares the district incorporated. It may construct improvements and maintain any facilities to prevent wind soil erosion, and may enter any district lands to prevent the spread of soil erosion and damage to other district lands. When work has been determined, a cost assessment may be made against improved lands, not to exceed the actual property protection benefit given to the owner.

Districts may borrow or accept grants from Federal agencies. Expenditures are authorized up to 20 percent of county automobile registration fees, plus all or any part of road and bridge special taxes authorized by county popular vote. The Act provides for remission of certain yearly State ad valorem taxes to nine county districts.

The second act differs from the first, chiefly in that it makes additional tax funds available for certain counties, while limiting the program to wind erosion control, and empowers districts to enter private lands without the owners' consent to perform necessary erosion control operations.

The legislation in Texas represents the greatest State advance to date in soil erosion control,[4] but the following deficiences exist in both Texas Acts:

(1) Possibility of lack of due notice and hearing for landowners before entry upon their lands for work, or before their assessment is determined, in the second Act.

(2) Both Acts are in part duplicates, permitting possible confusion by county operation under both.

(3) Both Acts seem to contemplate mainly the construction of terraces, ditches and dams, and listing, and not comprehensive changes in land use such as strip cropping, contour furrowing, crop rotation, retirement from cultivation of steep or highly erosive areas and land tracts badly gullied, soil stabilization with thick-growing soil-holding grasses, etc.

(4) Methods of voluntary cooperation of the farmers are not provided for.

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[2] Senate Bill No. 227, approved May 11, 1935, 1935 Texas Law, Chapter 214, p. 504; Vernon's Texas St. (1936) Art. 165a–1. See Appendix 8.

[3] House Bill No. 978, approved May 21, 1935, 1935 Texas Laws, Chapter 337, p. 771; Vernon's Texas St. (1936) Art. 165a–2, See Appendix 8.

[4] This year the U. S. Soil Conservation Service is cooperating with nine Texas counties organized as Wind Erosion Conservation Districts under the second Act. A number of independent water and flood control and conservation districts have been established under special Texas law for the control of water and drainage problems within particular riversheds, giving these districts limited powers to carry on further district control operations so far as erosion interferes with their water control problems.

b. Federal Legislation.—Not until April 27, 1935, did the Congress authorize a comprehensive Federal program for the control of soil erosion on arable lands. Under this first major legislation, the Soil Conservation Act, soil erosion was acknowledged to be a menace to the national general welfare, and the Congress established a permanent policy for its control and prevention. It did so in order to preserve our natural resources, control floods, prevent the impairment of reservoirs, maintain the navigability of rivers and harbors, protect health, and safeguard public lands; and incidentally to relieve unemployment.

The second major piece of Federal soil-conservation legislation, passed February 29, 1936, amended the above legislation. The Act as amended is called the Soil Conservation and Domestic Allotment Act, and gives the Secretary of Agriculture new powers. It authorizes temporary Federal aid to farmers for promotion of the conservation and profitable use of agricultural land resources, and also provides for a program of permanent Federal aid to the States for such purposes. The law provides that this temporary program is to be in effect during 1936 and 1937, and to be supplanted on January 1, 1938, by the program administered by the Agricultural Adjustment Administration, of grants-in-aid to the States.

This agricultural conservation program applies to all lands privately farmed. Regulations issued by the Secretary of Agriculture specify conditions which the farmer must meet in order to receive a cash payment.

There is also the Emergency Relief Appropriation Act of 1935, which authorized the President to include within the Works Program, projects for "prevention of soil erosion, . . . (and) seacoast erosion . . ." Pursuant to this authority, the Resettlement Administration established a number of erosion control projects on Federal lands, a few of which have been located within the Great Plains area. These projects have served to supplement the program of the Soil Conservation Service, and have been conducted very largely in cooperation with that agency.

3. *The Standard State Soil Conservation Districts Law.*—Three agencies of the United States Department of Agriculture—the Land Policy Committee, the Soil Conservation Service, and the Office of the Solicitor—have been continuously engaged in devising recommendations for appropriate State legislation for soil erosion control. On the basis of this cooperative effort the Secretary of Agriculture has recommended to the State legislatures the adoption of a Standard State Soil Conservation Districts Law.[5]

In essence this law provides a procedure by which soil conservation districts may be organized. They are to be governmental subdivisions of the State. In the main they are to exercise two types of power: (1) To establish and administer erosion control projects and preventive measures; and (2) to prescribe land-use regulations designed to prevent and control erosion. Such regulations are to have the force of law within the district.

It is believed that constitutional and legal requirements are met in the proposed soil erosion control legislation. This is the case either under present decisions of the State and Federal courts or under new trends therein since the depression.[6] They reflect an evolving legal pattern designed to meet the new crises of a new era through legislation enacted in response to public demand.

4. *Necessity for Additional Legislation.*—The

[5] See Appendix, 7. [6] Compare the *New York Milk Case*, a decision of the Supreme Court of the United States, *Nebbia* v. *The People of the State of New York*, 291 United States Reports 502, decided March 5, 1934, for the relationship between the legislative exercise of the police power and the guarantees of due process of law. See also the *Minnesota Mortgage Case* in *Home Building and Loan Association* v. *Blaisdell*, 290 United States Reports 398, 423–6, 434–7, 440. For a full citation of cases on various problems involved in determining the constitutionality of the "Standard State Soil Conservation Districts Law" see the pamphlet, "A Standard State Soil Conservation Districts Law", published by the United States Department of Agriculture, Government Printing Office, 1936, pages 32 to 64.

programs of the Agricultural Adjustment Administration and of the Soil Conservation Service probably will not succeed, without supplementary State legislation, in bringing about all the necessary modifications of destructive land-use practices in the Great Plains States. Excellent as far as they go, both programs are completely voluntary, so that if a substantial minority refuses to cooperate, the effectiveness of the program in many localities will be nullified or destroyed. The Soil Conservation Service projects are limited in area, while the program of the Agricultural Adjustment Administration is not sufficiently intensive to include all operations.

We must therefore turn to State legislation to supplement the Federal programs. Local agencies should be established. Within their respective areas they should perform or aid in the performance of intensive control operations. The lands of those who refuse to cooperate voluntarily in control programs somehow must be brought within the influence of the operations. Otherwise the washing and blowing of soil from such lands may make erosion control on surrounding lands difficult or impossible. As a means of achieving this control, the Committee believes that the States should enact legislation along lines which will permit them to cooperate with such Federal programs as may be developed.

Acquisition and Development of Submarginal Lands

1. *Relation to Other Problems.*—A close relationship exists between the legal acquisition and development of submarginal lands and the erosion control program generally. Erosion tends to be severe when submarginal lands are cultivated. The value of acquiring and developing submarginal lands is even more important as a supplement to rural zoning legislation to be considered later. Lands should be acquired as part of a public land-acquisition program, in order to devote them to more appropriate uses. Also such a purchase program may assist materially in obtaining land areas to be devoted to other aspects of the erosion-control program, such as grazing control, erosion-control, and land-rehabilitation demonstrations.

2. *Existing Legislation.*—*a. State Legislation.*—None of the ten States in the Great Plains area now has a State program for the purchase and retirement of submarginal land, and in none has such a program been authorized by law. However, comprehensive State programs in this field have been inaugurated in New York and Wisconsin. We can mention only their significant aspects.

New York has had a long-range constitutional land-acquisition program established by a referendum.[7] It provides for a substantial annual appropriation for acquisition by the State of lands best suited for reforesting; for protecting and managing such lands; and for acquiring and maintaining lands for forest tree nurseries. This program was instituted during the administration of Governor Franklin D. Roosevelt.[8]

Wisconsin also has a statutory plan for developing and preserving State forest land, both by purchase of the land and by encouragement of private owners to conserve their forest land.[9]

b. Federal Legislation.—While retirement of submarginal lands was one purpose and effect of the land purchases for national forests, parks, and wildlife refuges, until recently no Federal legislation has provided specifically for a submarginal land retirement program.

(1) *The National Industrial Recovery Act.*—Within the public works program authorized by the National Industrial Recovery Act[10] projects were authorized for the "conservation and development of natural resources, including control, utilization and purification of water, prevention of soil or coastal erosion . . . (and) any projects of a character heretofore . . . carried on either directly by public authority or with public aid to secure the interests of the general public . . ."

[7] November 3, 1931, Article VII, section 16. [8] See Appendix 9. [9] See Appendix 10. [10] Title II, approved June 16, 1933.

It thus appears clear that the Congress has not authorized the purchase of submarginal land merely to remove it from cultivation. However, to the extent that public projects of the nature of those mentioned in the language quoted may be carried out upon submarginal lands, their purchase for such public works projects is authorized.[11] Under this legislation the President allocated approximately $28,390,000 for a program of projects which involved the acquisition of a considerable amount of submarginal land.

(2) *The Emergency Relief Act.*—The 1935 Emergency Relief Appropriation Act likewise authorized projects involving: "sanitation, prevention of soil erosion, prevention of stream pollution, seacoast erosion, reforestation, forestation, flood control, rivers and harbors and miscellaneous projects." Under this Act the President allocated over $20,000,000 to the Resettlement Administration for acquiring real property needed for such projects.

Additional funds have been allocated for undertaking appropriate erosion control, forestation, and other work activities on the lands acquired. In this Act also the Congress did not authorize directly the acquisition of submarginal land for retirement purposes. In the Emergency Relief Act and under the National Industrial Recovery Act land need not be submarginal in order to be acquired for projects. However, both statutes permitted the development of a program of projects involving the retirement of submarginal lands as one necessary consequence.

(3) *The Act of 1935.*—In the Act of August 24, 1935,[12] for the first time the Congress specifically authorized a program for the purchase and retirement of submarginal land. It authorized the President to allocate moneys appropriated by the Emergency Relief Act of 1935 "for the development of a national program of land conservation and land utilization" and provided that "the sums so allocated may be used . . . (by) . . . the President, for the acquisition of submarginal lands and their use for such public purposes as the President may prescribe."

Under this Act the President allocated over $2,000,000 to the Resettlement Administration to acquire lands which could not work into their projects administered under the 1935 Emergency Relief Act. This allocation did not require lands purchased to be submarginal, although a great deal of the land may be of that type. The law authorized the acquisition of submarginal or other lands needed for a national land conservation program.

3. *Problems Legislation Must Solve.*—Present administrative experience, particularly Federal, discloses the legislative problems to be solved and the provisions to be included in a sound conservation program for the retirement, proper administration, and more appropriate use of submarginal lands.

This legislation should include (1) a statement of the purpose of the land acquisition; (2) a statement of the legal methods for acquiring the land through purchase, condemnation, gift, and exchange; (3) authorization to acquire real property or any interest therein as well as leasehold interests; and (4) authorization for purchase of defeasible title and later perfection of title. The act also should cover the retirement of submarginal land within the public domain; the provision of appropriations for administrative, investigational, and title expenses, as well as those incident to protection and conservation of the land and property thereon; and construction of necessary improvements to adapt the land to the use for which it is acquired. Provision should be made for general civil and criminal jurisdiction over the land acquired, including the criminal legislation necessitated thereby.

In order to effect the use for which the land is acquired, authority should be granted to dispose of the land by sale, lease, or other manner deemed desirable. The law should authorize

[11] See Opinion of the Attorney General to the Public Works Administrator to this effect, October 5, 1933.
[12] 49 United States Statutes 750–781; Sec. 55.

the inclusion of land in national parks, forests, Indian, or other reservations.

The above is only an outline of the proposed legislation. A study of the problem may show that there are many other provisions which should be included.

Most of the provisions are as applicable to State as to Federal legislation. A State program may well be founded upon the New York and Wisconsin laws previously considered.

Acquisition and Administration of Tax-Delinquent Lands

1. *Elements of the Problem.*—Excessive tax-delinquency is common in the Great Plains States and large acreages have been abandoned by their tax-defaulting owners. The legal problem consists in defining the required proceedings leading to acquisition of title to such lands, and the administrative and disposition powers over tax-reverted lands possessed by public agencies, for the purpose of facilitating the acquisition and coordinated administration of such lands by the States.

Tax statutes have been complicated by numerous additions, particularly during the depression, because of a desire to relieve hard-pressed taxpayers. Much of this new legislation naturally has interfered with normal tax-collection processes. Therefore, the main legal problem is the acquisition of a valid tax title by the appropriate governmental agency, and the administration of such tax lands as a part of a planned land-use program.

2. *Present Legislation.*—*a. Tax Deeds.*—First are the proceedings leading to tax deeds. Delinquent taxes are collected by the county treasurer in all but one (Texas) of the Great Plains States. In Texas this duty is divided between the collector of taxes and the authorities of the cities and towns. Real property taxes usually are enforced by sale of property taxes, or by enforcement of a lien on such property which, after a period allowed the owner to redeem, is convertible into a tax deed. The usual prerequisite to the sale is a published notice varying from 2 to 4 weeks, the sale always being at public auction.

In all States a period follows the sale during which the owner or anyone having an interest may redeem the land by paying the purchaser the amount of his bid, plus subsequent taxes, penalties, costs, and interest. Except in New Mexico and Texas, property bid in or forfeited to the county or other tax district may be sold during the redemption period. The normal operation of the redemption laws has been interrupted by a number of concessions granted taxpayers during the depression. After service of required notice and expiration of the statutory period of redemption, the purchaser is entitled to a deed.

b. Legislation to Strengthen Tax Titles—*(1) Judicial Sales.*—Texas is the only Great Plains State which provides that an initial tax sale must be preceded by court action. Foreclosure sale upon a judgment is provided for, after the original sale, in Kansas, Nebraska, New Mexico, North Dakota, and Wyoming. The action is analogous to foreclosure of mortgages by action. Redemption usually may be made from the foreclosure sale, except in Kansas where the sale is final. Foreclosure proceedings are costly where separate action must be brought against every parcel, but the statutes of most States permit all parcels in the county, irrespective of diversity of ownership, to be joined in a single unit.

(2) Deeds as Prima Facie Evidence of Their Recitals.—Each of the Great Plains States has specified by statute that tax deeds are to be considered prima facie evidence of certain facts on which they are based. Courts generally sustain such statutes, but hold invalid statutes making deeds conclusive evidence.

(3) Validating Statutes.—Many laws have attempted to validate tax sales or tax deeds generally against certain defects in procedure, and a number of others have been passed to cure defects in particular sales.

(4) *Limitations on Right to Attack Tax Deed.*—All States but Texas apparently have statutory limitations on the time within which suit may be brought against the holder of a tax deed, in addition to the longer statutes of limitations affecting land actions generally. Besides time limitations, other restrictions frequently are placed on the right to attack a tax deed or recover possession. In a few States a person seeking to assert title against a tax-deed holder is either limited to stated defenses or is required to prove designated facts.

(5) *Actions to Quiet Title.*—Even when there is some doubt of the validity of a tax deed, its holder may get a decision against adverse interests through an action to quiet title or similar suit, but the expense of this proceeding vitiates its value.

(6) *Other Proceedings.*—There are a few other statutes also designed to secure better tax titles or to remedy defects in tax-delinquency proceedings, which cannot be summarized here feasibly.

3. *Administration and Disposal of Tax-Reverted Lands.*—*a. Power to Lease, Exchange, and Manage.*—Counties are authorized to lease lands acquired under tax deeds in Kansas, Montana, New Mexico, Oklahoma, and South Dakota. Limited leasing powers exist in North Dakota. Authority to lease tax-title lands appears not to exist in other States. This is also generally the situation with respect to exchanging public lands.

Oklahoma alone grants general management authority to the governmental unit holding title under tax-reverted lands. The Montana and Colorado statutes give limited powers.

b. Powers of Sale and Disposal.—There are provisions in all Great Plains States for the sale of tax-delinquent lands after the redemption period has expired. Administrative rather than judicial sales are usual.

4. *Suggested Remedies.*—*a. Deficiency of Present Procedure.*—Serious defects exist in present procedures both for acquisition by public agencies of tax-delinquent lands, and for their administration by such agencies after acquisition. In the proceedings leading to tax deeds, numerous delays exist, and the title status is uncertain for long periods. The requirement that the acquiring agency offer the lands for sale frequently forces back into private ownership lands which should remain in public ownership. Existing statutes do not authorize adequately counties and other governmental agencies to manage and improve lands acquired; to lease them under appropriate supervision for desirable purposes; or to exchange lands thus acquired for others needed to block up areas for special purposes.

b. Suggestions.—Remedies are hard to suggest as the tax-law pattern in the Great Plains States, built up over years, is extremely complex. Certain things, however, are clear. Legislation should attempt to strengthen tax titles, such as provision for judicial sales; validating statutes; limitations on the right to attack tax deeds; and special provisions for less expensive actions to quiet titles.

A standard tax collection law was prepared and issued recently by the National Municipal League.[18] It has received much attention but no State has adopted it. Many delays arise from the unwillingness of legislatures and courts to facilitate the loss of a man's property because of tax-delinquency. Once tax-delinquent lands have reverted, however, the public agency should be given comprehensive statutory powers to redeem such lands, and to administer them for the most appropriate uses. While provisions requiring resale of such lands should be repealed, the power to sell parcels most appropriate for private farming in accordance with a comprehensive program of land use, should be placed in the discretion of the administrative officers.

Such legislation should authorize the acquiring

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[18] "The Model Real Property Tax Collection Law of the National Municipal League", *24 National Municipal Review 290*, May 1935. See the discussion of this proposed law in: Henry Brandis, "Tax Sales and Foreclosures Under the Model Tax Collection Law", *3 Law and Contemporary Problems*, Duke University 406–407, June 1936.

agency to improve and manage the lands; to lease them; and to exchange them for others. Finally, provision should be made to transfer such lands from subdivisions of the State to the State, or vice versa, in order that the most appropriate agency may administer the lands for the new land uses.

Grazing Control

1. *Problems of Regulation.*—To restore the range, control erosion, and stabilize the livestock industry, it is proposed that grazing be regulated by law. The scattered land ownership pattern in the Great Plains States creates one of the major problems of grazing regulation. Regulation must recognize that grazing lands are divided in ownership among the Federal Government, the State and county governments, and private owners; that the various types of ownership include resident owned lands and those owned by non-residents, such as railroads, insurance companies, and individuals. Besides these there are State-owned lands, mostly grants from the Federal Government, and county lands obtained from tax-delinquency. Finally, there is a small amount of public domain. These ownerships are generally located in small isolated tracts so widely distributed that it is difficult to create districts for purposes of regulation.

2. *Federal Regulation.*—The serious condition of the uncontrolled, eroding, and over-grazed public range led to the Congressional enactment of the Taylor Grazing Act in 1934.[14] This Act is designed to regulate grazing on approximately 142,000,000 acres of vacant, unreserved, and unappropriated public lands. Most of this land is outside the boundaries of the Great Plains, but scattered portions are in Colorado, Montana, New Mexico, Wyoming, North Dakota, and South Dakota.

This Act embodies two main purposes. The first is to prevent overgrazing and soil deterioration by means of conservation regulations providing for the orderly use, improvement, and development of the range. The second is to stabilize the dependent livestock industry by administering the use of the public range in such a manner that it will be possible for stock growers to plan operations over a period of years, on the basis of knowledge of climatic variability and range capacities.

The Secretary of the Interior is authorized by the Act to establish grazing districts on any part of the unappropriated public domain suitable chiefly for grazing. After public notice and hearing within the proposed area, a district is established by the issuance of an order defining the boundaries.

The Act provides further that persons entitled to grazing privileges within districts be issued permits entitling them to graze stated numbers of specified classes of livestock during a stated season or seasons. It is now known that some areas are best suited to winter grazing or summer grazing, others to spring and fall grazing, and still others to year-long grazing. In order to do all that needs to be done to preserve the lands and their resources from destruction and unnecessary injury, and in order to provide for the orderly use and development of the public range, the Secretary is authorized to increase or reduce the number of stock which may graze in a district, and to designate the seasons of use.

Local autonomy has been approximated by providing for the election of a local advisory board by those who are grazing stock on the lands in a district, and from among the owners thereof.

The Secretary of the Interior is authorized to make a reasonable charge for the privilege of grazing livestock within a district. Fifty percent of this sum is remitted to the State in which the district is located. Of the remaining 50 percent, deposited in the United States Treasury, 25 percent is pledged to appropriation for the improvement and restoring of the range.

3. *State Regulation.*—Only three of the Great Plains States—Montana, North Dakota, and

[14] See Appendix 11.

South Dakota—have adopted statutes to assist in regulating grazing on private and non-Federal public lands. Some of the States had adopted legislation to regulate grazing on the Federal public domain within their borders, but this, of course, became inoperative when superseded by the Taylor Grazing Act.

Two alternatives are available to western States which may desire to regulate grazing on their own publicly-owned lands. First, they may enact legislation parallel to the Taylor Grazing Act and establish grazing districts to function in the same manner as the Federal districts. Or they may implement by legislation a program to improve and develop their range lands, and then dispose of them through deeds of sale or leases so conditioned as to effect and maintain the range and to control erosion.

However, if neither of these alternatives is embodied in a legislative program for all the non-Federal public grazing lands within a State, such lands may be made available for regulated *private grazing, through cooperation with the* Federal grazing districts, or with cooperative associations of stockmen. This may be done in order to bring such non-Federal public lands within the control program being administered either by the Federal districts or by such private agencies.

4. *A Suggestive Pattern—The Montana Associations.*—A Montana statute passed in 1933 [15] provided for the incorporation of cooperative grazing associations. This statute was almost entirely rewritten by the Laws of 1935.[16] A companion statute to the latter was added to the Laws of 1935 [17] and established a State Grazing Commission which had authority to supervise and facilitate the operations of the cooperative grazing associations.

Each of these associations acquires control by lease of the lands owned by its members. Additional lands may then be leased from the United States under the provisions of the Taylor Grazing Act, from the States, from the counties, and from individuals and corporations, both resident and nonresident. The associations thus are able to block up large areas of range lands. Grazing permits are then issued by the association, first to its own members, and then to nonmembers if any surplus forage exists.

In Montana, public lands, State lands, railroad grant lands, county tax-reverted lands, and deserted homestead lands may all be found within one area. All of these lands may be so intermingled that no coordinated administration would be possible unless the right to administer these various ownerships could be unified under one control.

Therefore, cooperative grazing associations have been organized under the Montana statute and have acquired control of lands lying within the boundaries of Federal grazing districts established under the Taylor Grazing Act. The Secretary of the Interior has entered into cooperative agreements with State grazing associa*tions, giving them control of Federal lands,* under the supervision of the Division of Grazing. This is done in order to regulate more adequately the use and occupancy of the Federal lands. At the same time, it permits the coordinated use of all the lands—Federal, State, and private—in a district. Thirteen such agreements have been negotiated with Montana districts. This form of control is also being extended to areas in other States where similar conditions exist, even though to a lesser degree.

Voluntary associations, non-corporate in form, may be organized in any State without benefit of statute. Therefore, any group of stockmen may organize as a voluntary association. They thus may do for themselves what the cooperative grazing associations may do for their members under the Montana statute. If the members prefer the corporate form of organization, such a grazing association may be organized under the cooperative laws of most States.

[15] Chapter 66, Laws of 1933. [16] See Appendix 12, Montana Grazing Laws of 1935, Chapter 195. [17] See Appendix 13, Montana Grazing Laws of 1935, Chapter 194.

5. *What is Needed.*—Whatever the types of legal control that may be employed, the local cooperative grazing association appears to be essential to its complete success. In some States cooperative grazing associations may be incorporated under existing cooperative statutes. Experience indicates, however, that many more such associations will be organized and operated if the State emphasizes the opportunity by a special act providing for the organization of grazing associations, and establishes a State Commission to supervise and facilitate their program. For instance, only one such grazing association was organized in Montana before the passage of its first law, but today a number of such associations are in existence in that State, while none are in operation in any of the remaining Great Plains States.

The solution of the problem of leasing by grazing associations will progress materially if the prevention of the use of unsuitable lands for cultivation is enforced by law. There are two possible methods of accomplishing this result. One is by legislation providing for rural zoning. The other is by enacting land-use regulations in soil conservation districts that are organized under such a law as the Standard State Soil Conservation Districts Law. A considerable degree of grazing regulation can be made effective in any State which has adopted that standard act for the control of erosion. There is a direct relationship of grazing to soil erosion. Overgrazing is manifest in soil erosion almost immediately. Therefore, where lands within a soil conservation district are range lands, prevention of overgrazing must be accomplished if soil conservation is to be achieved.

Rural Zoning

1. *Existing Laws.*—Many States that permit municipalities to adopt urban zoning also grant power to zone undeveloped spaces within municipal areas. Some States have authorized counties to zone rural areas adjacent to cities. Thus suburban development is regulated by preventing its interference with planned city growth. The principle expressed in urban or suburban rural zoning has been applied by a few States to regulation of the use of agricultural land.

Three States have county enabling acts authorizing clearly rural zoning for agricultural and other productive land uses.[18] In addition some States have county enabling acts broad enough to include what is essentially rural zoning.[19]

Action under these enabling acts has been slow. The pioneer Wisconsin Act of 1929 was not utilized by a county ordinance thereunder until December, 1932.[20] None of the ten Great Plains States has enacted rural zoning enabling acts.

2. *Legal Problems.*—As several suggestive models are available, it is unnecessary to offer here exhibits of a State rural zoning enabling act or a rural zoning ordinance. Reference is made to the text of statutes and ordinances in force in Wisconsin, Michigan, and Indiana, and model acts prepared elsewhere.[21]

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[18] Wisconsin, Statutes, section 59. 97; Michigan, Laws of 1935, act 44, p. 70; and Indiana, Laws of 1935, chapter 239.

[19] Washington, Laws of 1935, chapter 751, dealing with "towns"; and California, 1931 Code of General Laws, section 5211b. The county zoning enabling acts which exist in other States, such as that of Virginia, Laws of 1927, Extra Session, chapter 15, p. 27, as amended by Laws of 1936, House Bill 504, and Maryland, Laws of 1933, chapter 599, p. 1239, are limited to suburban zoning and do not include authorization to zone for agricultural purposes.

[20] At present 23 northern Wisconsin counties are zoned under this act. These are the only counties in the entire United States which are comprehensively zoned for agricultural purposes. Two counties in Michigan are reported to be preparing to issue zoning ordinances under the Michigan legislation.

[21] "Model County and Regional Zoning Enabling Act", prepared by Mr. Alfred Bettman and included (at page 99) in Volume VII of the Harvard City Planning Studies, entitled "Model Laws for Planning Cities, Counties, and States", published by the Harvard University Press in 1935. The text of the "Standard State (Urban) Zoning Enabling Act", published by the Department of Commerce, may be used as the basis for a rural zoning enabling act insofar as provisions for administrative machinery are concerned. The statement of purposes to be advanced and the types of zones to be established, however, will need to be quite different from that appropriate for urban zoning.

It is suggested that the following provisions should be included in a zoning act:

a. One statute should combine power to zone for suburban purposes and for purely agricultural purposes, besides clearly authorizing zones regulating land use for recreation, agriculture, forestry, soil and water supply, conservation, and similar purposes.

b. The statute should specify the government unit to do the zoning. Counties have been and may be used preferably, but townships or special districts in existence may be used. Where a standard State soil conservation districts' law has been enacted, such districts are preferable to counties.

c. The enabling act should provide for cooperation among counties zoning rurally, and should make State experts available.

d. The advisory referendum should be used for determining whether a county shall be zoned.

e. The expert nature of zoning requires establishment of county zoning commissions separate from county legislative bodies, the former preparing suggested zoning ordinances for the latter. Final legislative responsibility must be left to a county board and cannot be left to a county commission.

f. Public hearings based on due notice should be required to consider objections and suggestions.

g. To be effective, zoning must embody a comprehensive plan for the whole.

h. A board of adjustment should be provided with authority to grant necessary exceptions on petition after public hearing. The constitutionality of such powers has been sustained in some States,[22] and held an improper delegation of legislative authority in others.[23]

i. While existing non-conforming uses can be changed only through a public purchase program, the statute may provide for forfeiture of the right to further engage in such use where voluntarily discontinued. Where tax delinquencies exist, redemption may make future use conform to zoning. The enabling act should provide that all non-conforming uses be published upon enactment of an ordinance, and should authorize the ordinance to prohibit extension of non-conforming uses upon additional land of owners specified in the publication as not conforming.

j. Violations of a zoning ordinance should be made a misdemeanor with fine or imprisonment or both. The county legislature should possess power to confer the right of civil redress upon landowners sustaining damage from a neighbor's failure to observe the zoning ordinance.

k. The enabling act should require recording of zoning ordinances and maps in the office of the county Register of Deeds.

l. The act should authorize necessary amendments of the zoning ordinance.

Farm Tenancy

Important legal problems related to land-use legislation arise from farm tenancy. While the tenancy problem is extremely aggravated in the Great Plains Region, it is not believed that there are any problems pertinent to this Region that are not also pertinent to other parts of the United States. It is believed proper to leave all observations concerning legal problems to the Special Committee on Farm Tenancy.

Water Utilization

1. *Why a Program is Needed.*—Water is a limiting factor in the Great Plains area, and water utilization is of basic importance to any land-use program. A long-time program involves many different water uses. Legal problems arise directly from each, or from the conflict between certain uses or readjustments. There is lack of State uniformity as to classification and uses of water, related rights and liabilities, and agencies involved. Many other legal problems exist, such as those arising from stream pollution, con-

[22] Georgia, Montana, Ohio, Oklahoma, Tennessee, and Wyoming. [23] Illinois, Maryland, and Oregon.

struction and improvements, and types of control or aid.

2. *Existing Laws.—a. State and Related Control.*—The State view is that control, appropriation, and use of waters within its boundaries is exclusively a State affair, constitutions or State laws usually declaring such waters to be State or public property on the grounds of State sovereignty. Most State codes provide a complete control for surface water resources by which rights to water are acquired, and its use administered.[24] Generally, utilization of the flow in natural water courses is subject to State administrative control and subject to appropriation under State doctrine.

In the Great Plains area there is a great variation in State laws. Because of the well-recognized State police powers under accepted legal theory, Federal control does not extend to strictly intrastate waters, except for certain established purposes confirmed by law or long usage. Both the Supreme Court and the Congress have recognized State control, the former on the theory that all rights to water rest upon State sovereignty and law.[25]

b. Federal Control.—Federal control over waters of the country rests on the power of the Congress over navigable waters, the commerce power over interstate streams, flood control, the use of public lands, Indian lands and reservations, contracts with irrigation districts, treaty obligations and interstate compacts.[26] The Congress has evidenced its intent to recognize water rights acquired over public lands in accordance with local laws and customs.

3. *Water Rights.—a. Rights as to the Use of Surface Water.*—One of the most important questions concerning Great Plains water rights arises from the conflict between the "riparian" and the "appropriation" doctrines. Under the "riparian" doctrine, each proprietor is entitled to have the stream come to his land flowing naturally, undiminished in quantity and unimpaired in quality, each owner having an equal right to make reasonable use thereof. Under the "appropriation" doctrine, the individual or group that first makes a beneficial use of water thereby acquires a prior right to its continued use. This doctrine is well established in the States of Wyoming, Colorado, and New Mexico, but in the other States of the Great Plains Region, both doctrines prevail.

In States where both "riparian" and "appropriation" doctrines exist, there is necessarily some determination of the extent of riparian rights and of their requirements on stream flow, and some plan for limiting these rights where they might interfere with the water conservation program. If the proposed water conservation program changes the character of stream flow, or otherwise disturbs conditions under which rights have been perfected, the general nature of these rights must be considered and remedies imposed on material changes in conditions. A water conservation program must recognize that rights of appropriators are based on certain conditions which may not be disturbed without compensation for loss or inconvenience caused them.

b. Ground-water Rights.—One of the complications in the development and efficient use of ground water in the Great Plains area, such as pumping for irrigation, is the lack of administrative control by States, with resultant uncertainty as to water rights.

New Mexico has the most comprehensive ground-water State control law, based on the appropriation doctrine as applied to waters having reasonably ascertainable boundaries.[27] Other States either have inadequate or no statutes relating to ground-water utilization control, and the courts thereof have followed one of

[24] "Legislative Aspects of the Use and Control of Water Resources", by H. D. Padgett, *Report of the National Resources Board,* 1934. [25] *California Oregon Power Co.* v. *Beaver Portland Cement Co.,* 295 United States Reports 142, decided April 29, 1935. [26] "Legislative Aspects of the Use and Control of Water Resources", by H. D. Padgett, *National Resources Board Report,* 1934. [27] See Appendix 14.

several rules or doctrines. The common-law or English rule, based on an absolute ownership of water by the landowner with no obligation to respect the rights of others, is followed much more generally than the American rule of "reasonable use" embracing the doctrine of correlative rights as defined by the United States Supreme Court.

Ground water is limited in amount, and control is needed for protecting existing rights by prevention of excessive development.[28] In many areas excessive pumping withdrawals for irrigation, industrial, and public water supply have lowered the water table to a dangerous level and necessitated State control of water use in these areas. In actual and proposed irrigation, public supply, or industrial-use developments, adequate consideration seldom has been given to the safe yield of the underground reservoir. Adequate consideration of development control becomes increasingly desirable.

The former National Land-Use Planning Committee and the National Advisory and Legislative Committee on Land Use in March 1933, adopted a report on State legislation relating to the use of underground water embracing the following principles:

(1) Subject to rights of the Federal Government, declare all unappropriated underground waters to be public waters of the State, subject to appropriation for beneficial use;

(2) Protect individual vested rights to underground waters;

(3) Vest the State Engineer, or corresponding official or commission, with administration of the law;

(4) Provide for investigations of underground waters and for designation of administrative areas;

(5) Protect holders of rights to underground water from excessive withdrawals;

(6) Provide for adjudication of rights to underground waters;

(7) Authorize the State administrative officials to require periodical reports from beneficiaries of the law;

(8) Provide for public supervision over installation of works;

(9) Provide for prevention of waste and contamination of underground water supplies.

The most effective method of control of ground-water use for the public benefit is believed to be under the doctrine of "appropriation", with the necessary control exercised by the State. The possible exception is for domestic use and stock water, which may be considered to be the universal use pertinent to the ownership of land.

4. *Interstate Water Problems.—a. Surface Waters.*—The most dependable surface-water supply in the Great Plains area is from the main rivers having as their sources the melting snow of the Continental Divide. These are not always directly affected by drought conditions in the Plains area. There are large irrigated areas and potential irrigable areas in Montana, Wyoming, and Colorado, which are watered by such interstate streams as the Missouri, Platte, Arkansas, and their tributaries. Therefore, important interstate water problems exist in the Great Plains area which may exert some influence on ultimate area development, inasmuch as the Supreme Court recognizes a State's right to secure an injunction against another State which causes damages by interfering with and altering the natural drainage conditions on an interstate stream.[29]

Various ways of settling interstate water questions exist. One method is by a United States Supreme Court suit between the States. Under the Constitution the Supreme Court has judicial power in controversies between two or more States, and in cases involving diversion and use of interstate stream waters, it has original jurisdiction to investigate and decide.[30] The Court has held that it will not exercise its

[28] See "Administrative Control of Underground Water; Physical and Legal Aspects" by Harold Conkling, *Proceedings American Society of Civil Engineers,* Vol. 62, No. 4, Part I, April 1936. [29] *North Dakota* v. *Minnesota,* 263 United States Reports 365 (1923). [30] *Wyoming* v. *Colorado,* 259 United States Reports 419 (1921).

jurisdiction except where the seriousness is clearly proved.

Interstate water questions also may be settled by suit between private parties in the State or lower Federal Courts. These are of numerous types. Generally a Federal Court sitting in the State where water is diverted has jurisdiction to enjoin the diversion of water which injures property in another State. Likewise, under certain conditions the State Courts have assumed jurisdiction over rights and priorities on an interstate stream in another State.

Interstate compacts are also used to settle interstate water questions, and have been effective in some instances.

b. Ground Waters.—Important interstate problems concerning ground waters as well as surface streams exist in the Great Plains area. Location of water-bearing strata or artesian formations under parts of several States makes control more difficult. It must be accomplished either by uniform laws, agreement, or compact among the States involved. Uniform legislation is desirable to solve interstate ground-water problems.[31]

5. *Problems of Construction and Improvements.*—A comprehensive conservation program must treat all phases of water utilization and require various types of construction and improvements.

a. Projects on Individual Farms.—There are check dams, ponds and reservoirs, involving either natural watercourses or surface waters. Where a natural watercourse exists its waters are public, and must be acquired by appropriation, subject to all prior rights, appropriation and riparian. If surface waters are involved, then different rights and liabilities govern under any one of three different rules applied to natural flow or drainage of surface waters and their obstruction. In the absence of law, a riparian owner may build a dam across a stream on his own land, but acquires no ownership or right to water thereby. He must not materially injure others on the stream. The owner of the land has a legal right to store water on his land in ponds and reservoirs, but without injury to others. Other legal problems arise from utilization of swamps, marshes, and wells for pumping ground water for domestic, stock, and irrigation purposes.

As to ponds, reservoirs, and small dams for water conservation, the State may purchase easements over private lands and authorize existing agencies to construct them. It thus appropriates money for a legal "public purpose", because the works are located on public lands. Instead of direct appropriations, the State could authorize irrigation districts, water control districts, or its other agencies to do likewise, such agencies regulating access to waters of adjacent landowners, individually or cooperatively.

b. Community Projects.—Among community projects may be large dams to check erosion, provide storage, and produce power for pumping or local uses; such dams must be located on natural water courses whose waters are subject to appropriation under State law. There may be also small irrigation systems from impounded surface waters or pumped underground water, with respect to which accurate determination of water supply and rights is most important. Small ponds for stock watering may be community projects. The legal problems may be solved best by establishing some district agency or organization to assume necessary authority for the construction, maintenance, and operation of these projects.

c. Projects of Municipalities, Irrigation, Conservancy, and other Districts: Municipal Water Supply.—One of the problems of even a dominantly rural area relates to securing an adequate and pure municipal water supply, both from surface streams and underground sources. Many legal problems arise in connection with securing adequate water rights for municipal supply.

d. Stream Pollution.—Prevention of pollution results from activities or enforcement by State administrative agencies, such as a State Board of Health, a commission, or committee; or munic-

[31] See Appendix 15.

ipal corporations, such as sanitary or sewerage districts; cities and counties; or under the nuisance or penal statutes. Both States and municipalities should seek the solution of such existing serious problems by construction of pollution abatement works.[32]

e. Large Irrigation Projects.—Any great extension of irrigation involves storage and construction of more difficult and costly projects. Before undertaking these, careful determination should be made of available surplus water supply, based on a study of prior rights of riparian owners and appropriators. Determination of adequacy of water rights constitutes a major legal problem of large irrigation projects.

6. *Types of Control or Aid: District Control.*—There are irrigation, reclamation, drainage, sanitary, conservancy and other similar districts organized as public corporations, although sometimes designated as municipal corporations.[33]

(1) Delegation of Power.—A great variety of water utilization districts have been delegated broad powers. The legislature may grant such a corporation all the powers it is capable of receiving, and make it, to use the United States Supreme Court expression, a miniature State within its locality.[34]

(2) District Acts Delegating Broad Powers.—Certain district acts delegate to the district broad powers relative to multiple use of water.[35] Thus the Texas law provides the following districts: Water Improvement; Water Control and Preservation; Water Control and Improvement; Fresh Water Supply; Levee Improvement, also known as Conservation and Reclamation; Drainage; and Navigation.

The following types of districts have been organized in two States which have delegated to them broad powers relative to multiple use of water: Water Improvement Districts; Water Control and Improvement Districts;[36] and Conservancy Districts.[37]

It is very desirable to make an analysis of all forms of districts and powers exercised before final decision is made on the possibility of utilizing some form of district to execute a proposed program.

A State water utilization program should be centralized in a public corporation or district, preferably in each major drainage basin. Within its constitution, the State appears to possess unlimited power to delegate authority to such districts. Therefore they should embrace all functions necessary to execute fully the water program.

7. *General.*—Lack of uniformity in statutes and decisions characterizes water law in the Plains area. Each State is sovereign so far as administration and control of its waters are concerned. The law of each is composed of constitutional and statutory provisions, and court decisions, sometimes embracing rules or legal doctrines at variance with those of other States. This lack of uniformity is a serious handicap to any program, and must be overcome by corrective legislation in the States, interstate compacts, or other action.

Conclusion

Any comprehensive program of conservation involves such readjustments in the uses of land and water, and such revision of customary farm practices, as to require vigorous implementation by legislation. Some elements of a program assume the use of public funds; some involve governmental administration; some must regulate the use of private lands. While the greater part of the required legislation may be permissive in nature, some small part of it must be mandatory. Implementation by legislation is clearly necessary.

[32] See the *Report of the Special Advisory Committee on Water Pollution,* National Resources Committee, 1935. [33] See McQuillan Municipal Corporations, 2nd Ed., Vol. 1, Sections 125 & 145. [34] Section 145, McQuillan Municipal Corporations 2nd Ed., Vol. 1. [35] See Vernon's Texas Statutes, 1936, Centennial Edition. [36] Chap. 3A, Art. 7880–1 to 7880–147w, Vernon's Texas Statutes 1936, Centennial Edition. [37] Throckmorton's Ohio Code, Annotated, Baldwin's 1936 Certified Revision, Chap. 11.

In considering the most desirable execution of supporting legislative programs, the question arises whether all subjects should be embodied in one composite bill or in separate bills. While the Federal Constitution contains no such provision, State constitutions commonly require that acts be limited to a single subject. The decisions have interpreted this to mean: in each bill one central subject-matter and all provisions pertaining thereto, separate subject-matters requiring separate bills. If a legislative program requires under the State constitution a number of separate acts, then the interrelations of these acts should be carefully worked out to make them complementary and reinforcing.

Too much emphasis cannot be placed on administration. At best, laws are only springboards to good administration. The types of public servants selected; their technical ability; the social viewpoint and sympathy with which they approach the problems involved; their administrative ability to obtain desirable results by pumping the warm blood of social accomplishment into the cold veins of the law—all these things proper administration alone provides.

Four basic facts stand out clearly from the foregoing analysis. They are the lack of law, the lack of uniform laws, inadequate laws or administration, and conflicts of jurisdiction. This means that new trails will have to be blazed, and adequate agencies established. Vision is needed. Above all, as Associate Justice Louis D. Brandeis has aptly said: "If we would guide by the light of reason, we must let our minds be bold."[38]

[38] *New State Ice Company* v. *Liebmann*, 285 United States Reports 262 (1931).

Memorandum IV

EDUCATION FOR CONSERVATION

Any program of agricultural, engineering, financial, legal, and other measures for economic rehabilitation of the Great Plains area, must be implemented by a complementary program of education. Long-established habits will not be changed to the degree and within the time required by the present situation unless those concerned become promptly and fully informed concerning the necessity and the urgency of action.

True conservation involves fundamental changes in modes of living. It has been indicated by data presented in this Report that many of the maladjustments within the Great Plains area have been the result of lack of understanding of critical physical factors. This lack of understanding permitted the development of patterns of agriculture and settlement, brought into the area as normal habits and practices of the regions from which the people had come, which are not well adapted to the conditions under which successful farming must be pursued in this particular Region. No constructive conservation program can be developed without changing these motivating attitudes and habits and redirecting the efforts of public officials and of citizens generally in the Region. These changes cannot be effected so much by law and other pressure mediums as by a program of education, in society generally as well as in the schools, that gives understanding of problems and of the adjustments necessary for their solution.

An appropriate educational program must reach the persons in the Region who live by the enterprise of agriculture; the agencies and organizations devoted to agricultural, civic, and social study and improvement; and the persons, agencies, and institutions located outside but whose influences reach within the Region.

Because of the availability and adaptability of certain materials of information, and because certain agencies outside the organized system of education are already at work in the Plains area, an educational program directed towards solution of the immediate and critical problems of conservation should begin at once to employ the many means already available for direct and rapid transmission of authentic information and indicated lines of action to the people in the area.

Concurrently, a program should be planned and introduced to employ the less flexible but more widespread and more basic institutions of organized education in the Region and in the Nation. Both approaches are essential to the creation of realistic and fundamental conceptions of soil conservation and the many related economic and social attitudes.

Existing Agencies, Materials, and Practices for Conservation Education of the People Generally

There are many Federal, State and other, social and scientific agencies engaged in activities of an educational nature. Their efforts should be concentrated immediately on the problem of soil conservation and land utilization.

The great need at the present time is to develop lines of attack whereby these agencies may consolidate their efforts in an integrated program, employ more fully the available knowledge in this important field, and devise procedures for filling the gaps which still exist in making an immediate program of conservation education a reality.

Federal Departments.—The two agencies of the Federal Government most actively concerned with the various problems of conserving the natural resources of our country are the Department of Agriculture and the Department of the Interior. The former, through its Cooperative Extension Service, Bureau of Biological Survey, Soil Conservation Service, Bureaus of Plant and Animal Industry, Bureau of Agricultural Economics, Forest Service, Bureau of Agricultural Engineering, Agricultural Adjustment Administration, and Rural Resettlement, has been intensively engaged in carrying on scientific study and demonstration projects in its many fields. Reliable data on how the farm and forest resources of the nation are being used and misused and how such misuse may be corrected have for years been gathered into bulletins and disseminated to the public through the Extension Service.

The Department of the Interior, through its National Park Service, Bureau of Reclamation, General Land Office, Bureau of Mines, Office of Indian Affairs, and Office of Education, has likewise done a great deal to preserve nature's bounties, promote their proper use and develop new resources.

In addition to these major departments of the Federal Government there are the Bureau of Fisheries in the Department of Commerce, the Corps of Engineers in the Department of War, the Public Health Service in the Department of the Treasury, and such independent agencies as the Civilian Conservation Corps, the National Resources Committee, the Rural Electrification Administration, and other Governmental and quasi-Governmental units whose work in one way or another is concerned with conservation.

State and Regional Offices.—In addition to the Federal agencies, there are regional, State, and local governmental agencies concerned with conservation. The State departments of conservation, agriculture, and education, and the State planning boards, are only four of the many State organizations which might be named.

Conservation Education by Government Agencies.—The Extension Service of the United States Department of Agriculture is the Federal agency that has been most actively engaged in direct educational work. In the United States as a whole, 5,826 county and home demonstration agents are working directly with farm people to put the findings of the Federal and State farm experiment stations into practice. In the Great Plains States, 1,257 such agents already have done much to correct farm practices and demonstrate appropriate home economy. Through the 4–H Clubs, these agents are reaching down to the level of adolescent children. It is estimated that approximately one million boys and girls, ten to twenty years of age, are enrolled annually in these clubs throughout the country. In the Great Plains States, these clubs have a membership of 156,212. Special emphasis this year is being given by the 4–H Clubs to the problems of conserving agricultural resources.

The Soil Conservation Service is cooperating actively in the Great Plains with the State extension services, agricultural colleges, and other State educational agencies, as well as with the Vocational Education Bureau of the United States Office of Education, in spreading knowledge about the physical and economic consequences of soil erosion and methods of soil and water conservation. Direct educational contact of exceptional importance is achieved with farmers cooperating in the twenty-three Soil Conservation Service demonstration areas and the thirty-two Civilian Conservation Corps erosion-control projects being carried out under direction of the Service in the Plains Region. At least

100,000 visitors from Great Plains farms and urban centers have inspected the soil and water conservation work being carried out in these areas. Surveys indicate that the conservation practices utilized in the demonstration projects have spread in less than three years to more than 22,000 farms and 2,800,000 acres outside of the project areas. Many farmers also have studied the work being done at ten soil erosion nurseries in the Plains Region where seed and planting stock of soil-conserving grasses and shrubs are being assembled and produced for use on the conservation operations projects. The interest of many Plains farmers has been aroused through their active cooperation in the collection of native grass seed and useful erosion-prevention shrubs not available in commercial nurseries. In 1935 and 1936 more than 500,000 pounds of native grass seed were collected in various parts of the Region. Still further educational advantages were obtained through the emergency drought-relief program carried out in the spring of 1936 to combat wind erosion by contour listing. Educational material and information relative to the problem of erosion and its prevention and control is being prepared constantly by field offices of the Soil Conservation Service and distributed in the form of Department of Agriculture bulletins, press releases and radio talks.

More recently the Agricultural Adjustment Administration has come into the field to subsidize practices of soil conservation which not only will make the farmers and the general public more aware of the conservation problem, but actually will demonstrate ways and means whereby farm resources may be conserved.

Other Governmental agencies, such as the United States Office of Education and the Office of Indian Affairs, are dealing directly with the problem. For five years the former, through its Future Farmers of America, has stressed the problems of agricultural and forest conservation. The year 1935–36 has seen 75,000 members of this organization actively engaged in various types of conservation activities. The Office of Education also has stressed conservation in the educational program of the Civilian Conservation Corps. Not only have the educational advisers of the camps given instruction in such problems to the young men, but most of the projects upon which these men have worked have been in one way or another related to the conservation of natural resources.

In order to coordinate better the conservation education now under the direction of the Office of Education and to be able to offer a more constructive leadership in servicing the various agencies of the organized education system, the Commissioner of Education has requested the addition to his staff of a conservation education expert and assistants. It is desirable that this unit be enabled to become a truly integrating force in the entire scheme of education for conservation.

The Office of Indian Affairs, through its Director of Education, is introducing into the Federal Indian schools, which accommodate approximately one-third of the Indian children, edited and translated conservation education materials. Furthermore, it has been requested recently to participate in planning the education program for those Indian children not in Federal schools whose instruction is the responsibility of State or local agencies. This will permit the Education Director to introduce conservation education materials into the non-Federal Indian education program.

The attention of all Government agencies having representatives in the field, is called to the fact that in some instances field work may be made a powerful educational force by conferences with citizens where the work touches their interests directly. For example, the development of the land-use program in Montana, explained in Appendix 5, has been promoted and improved by numerous discussion conferences in all parts of the State; and what is more to the immediate point, these conferences have brought to the participants a better understanding of the conservation

problem and of the way out of present difficulties. It has been truly a technique of education by participation in the solution of actual local problems.

Non-Government Agencies.—There are many private or non-government organizations which in one way or another interest themselves in specific aspects of the proper use of certain natural resources. One need name only the American Forestry Association, the National Wild Life Association, the National Association of Audubon Societies, the Izaak Walton League and Junior Waltonians, the National Recreation Association and similar associations. Such organizations unquestionably would be receptive to a suggested program of concentrated attention to the related problems of land use and conservation.

Other Organizations Which Should Be More Fully Enlisted

A list of agencies interested both in actual conservation of natural resources, and in the education of youth in this respect, would be incomplete if no mention were made of such organizations as the Boy Scouts, Girl Scouts, and Camp Fire Girls. Special emphasis this year is being given to the problem by such organizations as the Young Citizens League, operating in many rural schools in the Great Plains area. The national organizations which sponsor intercollegiate and inter-high school debates upon public issues of national concern are now giving attention to the problem, and more intensive discussion of conservation by them should be encouraged and promoted.

There are, of course, many other organizations such as the American Association of University Women, the General Federation of Women's Clubs, the National Congress of Parents and Teachers, and the American Association for Adult Education, which should be interested in, and offer leadership in, informing the public concerning the importance of conservation and in inspiring action along indicated lines.

Kiwanis, Lions, and Rotary clubs are of importance because they reach the professional and commercial groups, such as bankers and dealers in real estate, whose responsibility in connection with conservation is indeed great, and whose activities should be guided by a complete understanding of land-use problems.

Mention should be made especially of organizations whose memberships are concerned vitally with the problem: the American Farm Bureau Federation, the Farmer's Union, the National Grange; cooperatives such as the Wheat Growers Association and the Texas Cotton Cooperative. These could become powerful forces for sound farm practices and conservation generally.

The Public Schools and Conservation

The agencies of organized public education already have made at all levels of education a beginning of instruction in conservation. State universities, teachers' colleges, land grant and other colleges, in various ways have demonstrated their interest in this vital problem through research, through residence instruction, and through extension activities. The official public school courses of study in at least seven States have provided definitely for inclusion of instruction in conservation in connection with either the natural or the social sciences. Fifteen city and other school systems report the provision of specific units dealing with the conservation of natural resources, and there are undoubtedly others. The States of Wisconsin and Florida recently have adopted laws requiring conservation instruction in the public schools; and Florida now requires by law that all persons preparing to be teachers shall have training in the conservation of natural resources. Many higher institutions of learning for some time have had or recently have reported the establishment of courses of instruction in which soil conservation is a major interest.

Problem of Educational Adjustment.—Over thirty-two million persons are enrolled in public and

private elementary and secondary schools, colleges, and universities, and in public night, summer, part-time, and continuation schools of the Nation. Because of a certain inertia, the more immediate use of such institutions in a conservation program calls for a redirection of attention in a few phases of their activities. The ultimate goal of such a program is a functional reorganization of these institutions to achieve a more realistic education in the social and economic problems of modern life.

In order to employ educational institutions appropriately in either a narrow or broad conservation program, all the factors in organized education must be adapted to the purpose. It is hoped that the program will recognize the necessity for leavening the organization in every phase. Teacher training and teacher retraining must concern itself with conservation problems of both natural and human resources. This, however, for many years will be relatively ineffective unless concurrently there are appropriate revisions of curricula, instructional and pupil work materials, text books, and such instruments as are commonly employed by teachers. Satisfactory utilization of the institutions of organized education in this program can only be achieved by broad scale revision of procedures and instruments.

Training of Teachers.—Teachers in training must be reached with courses that both give a broader knowledge of pertinent fundamental sciences and a more realistic understanding of the problems of conservation in detail. The teacher-training institutions in the ten Great Plains States should at once, individually or collectively, give further attention to this problem. Their success in designing a program which would prepare teachers who in turn could appropriately teach conservation would no doubt give impetus to such training throughout the Nation.

A great proportion of the teachers now in service will not be involved again in any formal intensive training program. It is important, therefore, to plan a teacher retraining program in the Great Plains States. This retraining program might involve the use of county teachers' institutes where they still exist, county teachers' meetings, and other devices of in-service training such as the preparation and distribution of special teaching suggestions and bibliographies of educational materials for use by various age groups. All Smith-Hughes teachers in agriculture and in home economics could make use of such facilities; in fact they constitute a group which should be a strong factor in conservation education.

Especially important is the development of an adequate system of supervision of instruction in the conservation of resources. Adequate supervision will go far in compensating for the deficiencies in training among those teachers who in the immediate future must be utilized for the desired instruction.

Adapting Scientific Material to Teaching Purposes.—Some of the organizations which have been mentioned—governmental and non-governmental—have been active in conducting scientific experiments and in gathering scientific data on the various problems involved in the conservation of natural resources. Any effective program of conservation education is definitely dependent upon the availability of materials which will have genuine scientific authenticity.

Once such materials are at hand, it is obviously a responsibility of trained educators so to organize them that they may be made to serve in the immediate program of teaching appropriate action in the present crisis, and also in the long-term program of creating proper attitudes. Much of the material now available is of debatable educational value, not so much because of questionable authenticity of the technical content as because it has not been organized or disseminated in a form suitable for educational use. Material should be presented in simple understandable form, and the visual technique employed in every possible manner. The task of educators in cooperation with conservation

experts in the immediate program is to reshape the existing materials to serve an educational function by translating, coordinating and directing specialized information so that it will reach existing agencies and institutions in forms more suitable for integration in courses of study, club action programs, open forum discussions, radio broadcasts, motion picture presentations, dramas, class-room discussion units, and other educational approaches to the children and adults of the Nation.

The new findings of research should be made available to teachers promptly and currently. Scientists should not wait before publication until they have discovered all the facts bearing on a problem, if facts already discovered are of guiding significance. Conservation education must go on every day, and the latest information should always be available to teachers.

It would be helpful, for instance, in the development of conservation farm practices if the Weather Bureau were to publish in the agricultural press and in rural newspapers, at critical seasonal intervals, data concerning current precipitation and moisture conditions, supplemented by a summary review of trend conditions and the relations of current conditions to the trend. These data would be helpful to teachers and to farmers who plan operations on the basis of precipitation and soil-moisture conditions and prospects.

Since teachers—in spite of their own desires to give better instruction—are frequently restricted by the textbooks, reference materials, pupil work materials, and such facilities, it is most important to engage in this program the sympathetic interest of publishers and authors of accepted textbooks. They could be induced to indicate wherein these conservation materials would fit into courses employing their texts. In all probability, such counsel would lead them to embody desired material in their own textbooks when new editions are printed; at least they would be aware of a vast amount of material which could be cited for reference and become an important part of the program presented in work manuals which are used with such textbooks.

Education and Community Life

In many of our communities education has not had a direct relation to life itself. It too often has been a preparation for something rather than a growth in intellectual power and purposeful living. The school must become the community as it thinks and acts. The school must lead the community to establish its own forward-moving policies and guide those policies through their application. There is envisioned a school which, as regards plant, would comprise the rightly ordered and efficiently operated agricultural, industrial, commercial, social, and residential elements of the community; a plant to which old and young would turn for guidance to experts, libraries, and laboratories. People of all ages would come into its center; those at its center would be constantly carrying their findings into every home and making them operative for more effective living.

Health, wealth, conservation, and utilization of natural resources would be direct concerns of the school. The staff would consist of all those who could contribute in knowledge, skill, or attitude, making for the more effective coordination of community and individual living. The membership of this staff of necessity would include personnel from all agencies engaged in the land-use and conservation program of the community, including those who live on and use the land. In fact, through that powerful educational agency, "discussion groups", the members of the community itself would become an essential element of the teaching staff. Finally, conservation would be broadened beyond its relation to natural resources, and would embrace the conservation of all human values through the creation of a community which would utilize cooperatively all technical knowledge and would be a normal expansion and modification of our traditional democratic form of government.

Integration of Educational Efforts

It must be admitted, however, that coordination of efforts and programs of these out-of-school agencies has been lacking. The very existence of so many constructive educational influences in many out-of-school agencies which have not yet become a part of the in-school program is indicative that the public education system as it is now organized is too slow in including in its learning program many of the vital problems of life. Inasmuch as the direction of any program of conservation education must consider the coordination of efforts to out-of-school agencies with the school programs in order to achieve effective results, it should be the goal of this direction so to relate education to community, county, State, regional, and National planning for the use of natural and human resources, that education becomes a process of learning by purposeful participation in the life of the community, and the life of the community becomes, for all ages, a series of educational experiences.

As has been indicated, many agencies are already engaged in such educational work, and others not now so engaged are available. The outstanding educational problem, therefore, is one of integrating the efforts of all such agencies into one coordinated intensive program.

Democracy and Education

In a democracy, education is more fundamental even than legislation as a force directing rational progress. It is the basis of wise legislation, promotes general acceptance of legislative and administrative measures, and guides individuals to action along lines consistent with the requirements of the society of which they are members.

In view of the preceding discussion it is therefore an urgent need that those responsible for the direction of educational policy in each State, and those responsible for the direction of Federal cooperation in education, should formulate promptly a nation-wide program of education in conservation, flexible in adaptability to regional need and especially intensive in the Great Plains area. Emphasis on social and technical phases should be rationally apportioned. Utilization of every formal and informal existing and potential educational agency should be provided for in the program. There should be included a subordinate program for training teachers of many specialized fields where and how conservation material may properly and effectively be incorporated into their instruction. Manuals of teaching materials should be prepared and published, and suitable text books be made available. To assure continuity of effort in this direction, and especially to assure well-coordinated efforts, provision should be made for the proper organization of educational facilities and the unified direction of the program.

Reports of conditions, causes, and recommended lines of action for solution of national problems remain but so much dead printed matter if not vitalized by some dynamic force. In a democracy the primary dynamic force is education, for the processes of democracy require common understanding and an inspired impulse among its citizens to action leading to every commonly accepted objective.

APPENDICES

Appendix I

THE PRESIDENT'S LETTER OF INSTRUCTIONS

THE WHITE HOUSE,
Washington, September 17, 1936.

MY DEAR MR. COOKE: I am writing to ask you to serve as chairman of a special committee whose duty it will be to make a report to me not later than January 1 on a long term program for the efficient utilization of the resources of the Great Plains area. I am anxious that we leave no stone unturned in exploring and reporting on all the possibilities of this region, as one in which reasonable standards of living can be maintained by the largest possible population. We should face the fact that the climatic conditions make special safeguards absolutely necessary. I would like your report to include such recommendations for legislation as you may deem necessary. The report now called for is an amplification of the recommendations presented to me at Bismarck.

In the letter appointing the earlier committee I said:

"We have supposed that the modes of settlement and of development which have been prevalent represented the ordinary course of civilization. But perhaps in this area of relatively little rain, practices brought from the more humid part of the country are not most suitable under the prevailing natural conditions. At any rate circumstances make it obvious that relief activities are not sufficient and that a competent study and recommendations are desirable."

You are advised that I am appointing another committee to report on the crop insurance feature of this general problem. After consulting with the heads of their several Departments I have designated the following to serve with you on this committee: Prof. Harlan H. Barrows, member Water Resources Committee, National Resources Committee, Chicago, Illinois; Dr. H. H. Bennett, Chief, Soil Conservation Service, Department of Agriculture, Washington, D. C.; Dr. L. C. Gray, Assistant Administrator, Resettlement Administration, Washington, D. C.; Col. F. C. Harrington, Assistant Administrator, Works Progress Administration, Washington, D. C.; Col. Richard C. Moore, Division Engineer, Missouri River Division, Corps of Engineers, United States Army, Kansas City, Missouri; Mr. John C. Page, Acting Director, Bureau of Reclamation, Washington, D. C.; and Dr. Harlow S. Person of the Rural Electrification Administration, Washington, D. C.

Sincerely yours,

FRANKLIN D. ROOSEVELT.

Mr. MORRIS L. COOKE,
Administrator, Rural Electrification Administration,
Washington, D. C.

Appendix 2

ACKNOWLEDGMENTS

The Great Plains Committee desires to record its appreciation of cordial assistance from many sources.

Public Hearings.—Its predecessor Committee, The Great Plains Drought Area Committee, during the summer of 1936 held public hearings in the course of a tour which included Amarillo and Dalhart, Texas; Springfield and Lamar, Colorado; McCook and Chadron, Nebraska; Rapid City, South Dakota; Gillette, Wyoming; Miles City, Montana; and Bismarck, North Dakota. The present Committee in December 1936 held hearings in Dalhart, Texas; Bismarck, North Dakota; and Washington, D. C.

These hearings in the aggregate were attended by the governors of the States concerned, either in person or through designated representatives; by representatives of pertinent State agencies such as State planning boards; by representatives of farmers' organizations; and by many citizens in their individual capacities. The testimony at these hearings, the memoranda of State conservation commissions and planning boards, and other documents submitted have been of noteworthy value.

Correspondence.—Many citizens of the Great Plains area, and a number outside the area, who were not able to attend the hearings, took the trouble to relate their experiences and express their views to the Committee by correspondence. All pertinent suggestions in these letters were noted for the use of the Committee.

Departments of the Federal Government.—Cooperation among agencies of the Federal Government is a matter of every-day experience, and on this ground the Great Plains Committee is indebted to many Federal agencies. In addition, many of the data pertaining to conditions in the Great Plains during recent years are to be found only in current files, and to draw off those data requested by the Great Plains Committee has imposed laborious tasks on several agencies. For such data the Committee is especially indebted to Resettlement Administration and Soil Conservation Service of the Department of Agriculture, Works Progress Administration, and Farm Credit Administration.

Special Memoranda.—A number of memoranda on special subjects were prepared by various individuals and agencies for the benefit of the Committee. Inasmuch as none of these authors is responsible for the nature and extent of use of their memoranda by the Committee, and especially as they should not be held responsible for views on the respective subjects expressed by the Committee in this Report, these most helpful contributions are acknowledged here collectively and not in detail.

Appendix 3

SOIL AND WATER CONSERVATION IN THE GREAT PLAINS TYPICAL RESULTS OF OPERATIONS PROGRAM

BY THE SOIL CONSERVATION SERVICE

Spectacular dust storms in 1934 and 1935 brought into sharp relief the vital problems of agriculture on the Great Plains. Unprecedented, they came first from the southern sector of the Plains—the drought-ridden fields of the Texas-Oklahoma Panhandle, western Kansas, eastern Colorado, eastern New Mexico—and then from the other Plains States to the north. Drought and misuse of the land have brought the scourge of wind erosion to a vast total area throughout the Plains Region, from near the hundredth meridian on the east to the foothills of the Rockies on the west, and from the Panhandle of Texas in the south to Canada on the north.

Human enterprise clashed with elemental forces of nature in the occupation of the Plains. That story, of grass and cattle, wheat and tractors, drought, and finally, of dust, is told in the body of this Report.

Today, in real accomplishment on the land, progressive men are writing a sequel of compromise to that story of conflict. In representative areas up and down the Plains, they are adapting their use of the land to the unusual conditions which nature imposes on the Region. The results they have obtained seem to sustain the practicability of Plains agriculture and indicate the fallacy of a rather widespread assumption that the whole of the Region is unsuited climatically and otherwise to farming.

It is the purpose of this appendix to set forth some of the results obtained in support of the belief that conservation of water and soil resources through better land-use practice will prove, on the better land at least, the answer to the dilemma of Plains agriculture.

Water is the Key

In the Great Plains, water, in a sense, is the beginning and the end of agriculture. Without it there can be no crops, of course; and crops are needed to anchor Plains soil against the wind. Without water, cultivated soil, depleted of binding grass roots and spongy humus, is turned into a dry powdery substance. It starts to blow.

On the Great Plains, rainfall is scant and irregular. Usually there is enough to make a crop if none is wasted. As much water as possible must be stored in the underground reservoir of the soil or in surface reservoirs to bridge long dry spells between the rains. Conservation of rainfall is essential in Great Plains farming; and measures of water conservation are, in effect, the first defense of the soil. Good land use, therefore, requires the retention of rainfall moisture on the land as the first step in protecting the soil from erosion.

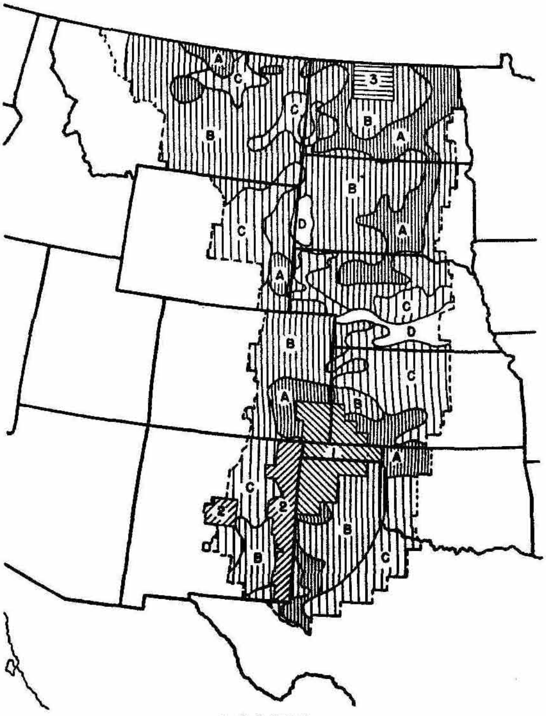
Cooperative Conservation Program

Since the spring of 1934, the Soil Conservation Service and some 2,000 farmers and ranchers on the Great Plains have been cooperating in a series of land-use demonstrations embodying the actual application of conservation principles to more than 600,000 acres of typical Plains land. Fifty-five separate demonstrations are now under way in scattered areas throughout the Region (Figure 40). In effect, they provide a network of conservation "show windows" in which farmers of the Plains country may see conservation practices in operation, learn how to apply them to the land, and judge their effectiveness in terms of actual results on the land itself.

Each demonstration area is a distinct entity, selected because of the very severity and the representative nature of its land problems. In each, a physical inventory of the land has been made by survey experts of the Soil Conservation Service. Erosion conditions, as well as the factors influencing erosion—topography, soils, and land use—have been mapped in detail. Complete plans for a coordinated program of land treatment, involving the application of conservation practices in accordance with the differing needs and adaptabilities of each parcel of land, have been made for individual farms (Figures 41 and 42). Farmers and ranchers voluntarily are putting them into effect under the guidance of conservation specialists.

The primary purpose of the work in these selected areas is one of demonstration. The introduction of conservation farming practices on more than half a million acres in less than three years' time, however, represents no

GREAT PLAINS AREA
GENERALIZED MAP SHOWING
DOMINANT CONDITIONS OF EROSION



U. S. DEPARTMENT OF AGRICULTURE — SOIL CONSERVATION SERVICE

FIGURE 39

inconsiderable advance in the better utilization of Great Plains land.

Before the initiation of the demonstration program only 10,454 acres in the 55 project areas in the Plains Region were farmed with a view to conservation of water and soil. Today, conservation farming practices are being applied to more than 600,000 acres in the same areas. More than 155,000 are being strip cropped (Figure 32) to retain water and protect the soil from wind. Nearly 200,000 acres are being tilled on the contour to conserve rainfall and impede the sweep of wind (Figure 43). Contour furrows have been run on some 85,000 acres of grass land to conserve water (Figure 44). More than 3,600 miles of terraces—more than enough to span the United States—have been built to hold the moisture on some 65,000 acres; when present agreements are completed, nearly 150,000 acres will be terraced (Figure 33). In the 55 project areas, the acreage devoted to clean-tilled, erosion-inducing crops is being reduced 16 percent and the acreage of dense erosion-resisting crops increased 28 percent. Nearly 200,000 acres of grass land on which grazing was formerly uncontrolled, are now being carefully managed to prevent overgrazing and consequent erosion.

All of these practices are designed to retain rainwater on the land, force it into the reservoir of the soil, increase the underground reserve of moisture for the nourishment of crops, and increase the production of protective vegetative cover for the land. They are not difficult of application; the average farmer on the Plains can easily follow them in the culture of his land.

For surface storage more than 2,100 dams have been built in the Great Plains Region with Civilian Conservation Corps, Works Progress Administration, and drought-relief labor under the direction of Soil Conservation Service engineers (Figure 45). Most of these dams were constructed on the lands of cooperating farmers and ranchers as part of the normal demonstration program of the Service; others have been built outside of the demonstration areas as part of the emergency drought-relief program. Their total storage capacity is estimated at nearly 32,000,000,000 gallons—a material addition to available water supplies for stock, irrigation, and other purposes in the Plains Region.

More important than this land treatment work itself, however, is the effect which it has made in convincing Great Plains farmers that soil and water conservation is both practical and advantageous. More than 22,000 farmers and ranchers outside the boundaries of the demonstration areas are known to have applied one or more of these conservation practices to more than 2,800,000 acres in the Plains. Such rapid and widespread acceptance of sound conservation principles would appear to indicate not only the effectiveness of the program but the readiness of Plains farmers to accept advice and to adopt, voluntarily, proved methods of soil defense.

Emergency Program

In the spring of 1936, the Soil Conservation Service cooperated with State and local agencies in an extensive emergency listing program designed to curtail wind erosion damage in the Southern Plains. Agricultural engineers from the operations projects of the Service directed the running of contour lines wherever requests for their services were received from State and county officials.

During this emergency program nearly 2,500,000 acres were listed on the contour. From five to eight inches of rain fell late in May. The water caught and stored in the soil as a result of the contour listing meant the difference between a crop and a crop failure in nearly every instance. Measurements indicated that on the average, one inch more of rainfall soaked into the contoured land than into similar land untreated or plowed n straight rows. This meant that the contoured soil was wet more than one foot deeper than the soil which was not contoured. This amount of additional underground water storage increased the probability of crop production by 75 percent, and meant additional protective residues for the prevention of wind erosion during the 1936–37 winter-spring "blow season."

On a farm near Hereford, Texas, for example, a rain o 6.53 inches during the ten-day period from May 18 to 28, 1936, penetrated to an average depth of 37 inches on blown out wheat land which had been listed on the contour. On adjoining wheat land listed in straight rows up and down the slope the moisture penetration during the same period was only 20 inches. On the Soil Conservation Service project at Vega, Texas, ten days of rain totaling 5.48 inches soaked the soil to an average depth of 2.15 feet on contour tilled land. In similar fields farmed in straight rows, moisture from the same rain penetrated to an average depth of only 1.48 feet.

Near Springfield, Colorado, an average of 4.58 inches of rain was reported for the month of May 1936. Measurements showed a moisture penetration of 44 inches on contour listed land as compared to 35 inches on land listed in straight rows.

On a 640-acre farm near Channing, Texas, 3.42 inches of rain fell between May 1 and May 22. Fields which had been terraced and contour listed were wet to a depth of 36 inches. Adjoining fields, unterraced and uncontoured, were wet to a depth of only 17 inches.

In the vicinity of Clayton, New Mexico, the total rainfall for May 1936 was only 1.6 inches, of which not more than 0.5 or 0.6 inch fell in any one day. On a contour listed field of sandy loam soil, measurements showed a

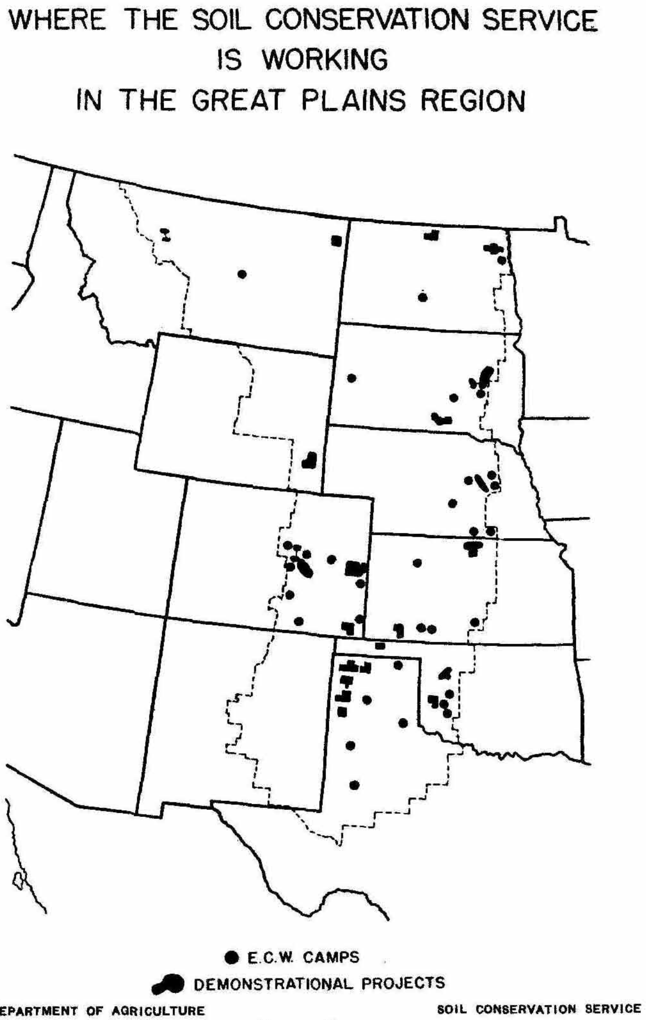

WHERE THE SOIL CONSERVATION SERVICE
IS WORKING
IN THE GREAT PLAINS REGION
E.C.W. CAMPS
DEMONSTRATIONAL PROJECTS
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FIGURE 40

moisture penetration of 15 inches as contrasted to 11 inches on adjoining fields which had not been contoured.

Texas Panhandle

Typical of the soil and water conservation projects in the southern portion of the Plains is the one at Dalhart, in the northwestern corner of the Texas Panhandle. In an area of 47,175 acres near this town, the Soil Conservation Service and a group of cooperating farmers are demonstrating land-use principles and cultural practices designed to conserve water and protect the soil from wind erosion.

They are working under conditions generally typical of the Southern Plains. Ninety-five percent of the area is occupied by Amarillo sandy loam, Amarillo loam, Pullman silty loam, and Potter clay loam—soils which predominate in the Panhandle country. The land slopes very gently—gradients greater than three percent are rare. There are no streams; the area drains into shallow "wet weather lakes." Rainfall near Dalhart has averaged 18.03 inches for the past 30 years. Characteristically, winds are from a southwesterly direction, with an average velocity ranging from about 8 miles per hour during March, April, and May—the severe "blow season"—to about 6 miles per hour during the other months of the year. In the late winter and spring, however, individual winds sometimes attain a velocity of 30 miles an hour or more.

In the past, agricultural practices near Dalhart followed the pattern set throughout the Southern Plains. When the demonstration area was established in August 1934—less than three years ago—wheat and row crops largely had replaced the soil-protecting native grasses. Like their fellows elsewhere in the Southern Plains, farmers and stockmen of the area generally had failed to realize that the practice of grazing or burning the last stalk of stubble from cropped fields and the last blades of grass from pastures is an invitation to eventual soil destruction. And in the project area, as elsewhere through the Region, protracted drought had severe effects. In the summer of 1934, the land selected for the Dalhart project was in as critical a condition as any in the Great Plains (Figure 39).

Wind erosion had severely damaged 56 percent of the area. Some 11,200 acres of cultivated land had been badly hummocked by the accumulation of wind-driven sands in clumps of Russian thistle and other weeds; some 9,103 acres had lost from two to four inches of topsoil; another 2,500 acres had lost more than four inches of topsoil, some of it blown out to plow depth. Eight percent of the area, including one-fourth of the grass land, had been damaged by shifting sands.

Economic and social consequences of land mismanagement were commensurate with damage to the land itself. Some financial institutions had ceased to loan money for the purchase of farm lands, and land values generally had suffered in accordance. Many tracts within the project area were not salable at any price, homes were abandoned, and health authorities reported an increase in respiratory diseases during the "blow" months of winter and spring. Men found it difficult to do a satisfactory day's work during blinding, choking dust storms. The picture was not a bright one, but it was no worse than the picture of the Southern Plains as a whole.

Today, soil still blows in the project area, and farming still is hazardous on unprotected land. But soil blows from far fewer fields, and the prospects of a crop are a good deal better than in 1934. Much more important is the confident attitude of the farmers in the area and the effect the work is having on farmers from outside who see in the project what sensible land use and reasonable concessions to nature can accomplish.

From the air, many of the transformations that have taken place on the land near Dalhart in the last three years would be quite evident. Then, the land below would have been a checkerboard of quadrangular fields planted solidly to single crops like wheat or sorghum. Now, in many places, the pattern would be curving strips (Figure 46), where solid planted fields have given way to strip crops planted on the contour. Some 10,000 acres—nearly half the land involved in the demonstration—is strip cropped now. In August 1934, there was not a single strip cropped acre in the area.

Three years ago, the furrows in a cultivated field would have looked from the air like fine parallel lines running straight across the land. Today, many of those lines would curve along the gentle slope of the field, because on more than 12,000 acres crop rows now are plowed on the contour. Every acre in the area was plowed in straight rows when the work started, although contour tillage is one of the most effective methods of saving rainfall moisture and impeding the sweep of wind.

Heavier lines curving through the grass of pasture lands would be contour furrows, put there to catch rain-water and force it to penetrate the soil. Nearly 2,000 acres of pasture already have been contour furrowed. Not a single contour furrow existed in the area before the program got under way.

Today's air view of the area would reveal still heavier lines—more like bands—winding across the fields below. These would be dry land terraces, built on the contour and closed at both ends to trap all the rain and hold it on the land. End to end, the terraces built in the Dalhart project area since August 1934 would extend 460 miles. They conserve water and provide protection for 16,000 acres.

Less evident to the air observer but equally important from the standpoint of Plains agriculture would be other changes that have taken place in the project area near

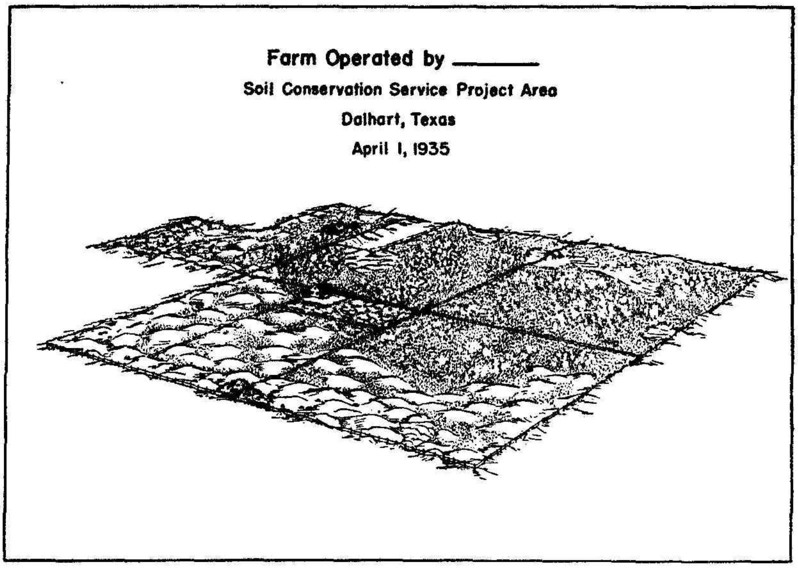


FIGURE 41.—*This drawing was made from an actual erosion survey map of a 2,960-acre farm whose owner is cooperating in the Soil Conservation Service demonstration near Dalhart, Texas. It shows conditions as they exis ted prior to the beginning of conservation operations in April 1935. The entire farm had been cropped continuously in wheat with no effort whatever to conserve moisture or utilize crop stubbles for soil protection. Hummocks formed by the accumulation of wind-blown soil in clumps of weed marred almost the entire cultivated acreage. In the northeast fields large strips were blown out to plow depth. The pasture land surrounding the farmstead had been seriously damaged by drifts from the adjacent "blow" fields. The farm was regarded as one of the most serious "blow" spots in the Dalhart area.*

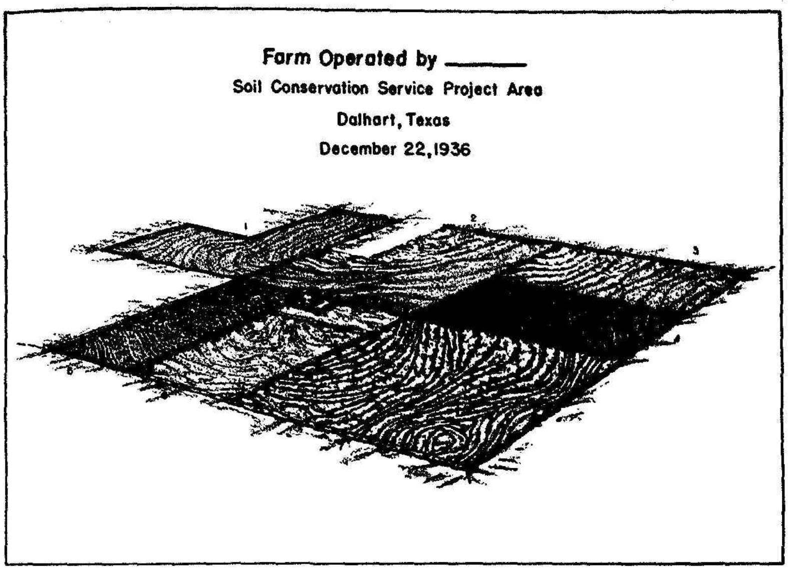


FIGURE 42.—*This drawing of the farm shown in Figure 41 was made from an actual conservation practices map showing conditions as they existed less than two years after conservation operations were begun.*

Field No. 1 was terraced and contour chiseled, and is now planted in wheat.

Field No. 2 was terraced and contour chiseled. This field has a 75 percent cover of grain sorghum stubble.

Field No. 3, spotted with areas of shallow poor soil, was terraced and contour drilled with a mixture of sudan grass and cane in preparation for native grass seeding, and is now receiving partial protection.

Field No. 4 was contour planted to grain sorghum; a profitable crop of grain and forage affording 100 percent protection.

Fields No. 5 and 6 are being returned to native vegetation, along with Field No. 3. Both fields will be seeded to blue grama grass when moisture and other conditions are favorable.

Field No. 7 was contour chiseled in March and summer fallowed.

One hundred trees planted as a windbreak near the farmstead in 1935 are thriving. They will be supplemented by an interplanting of the same number.

The percentage of the farm stabilized against destructive wind action, excluding the small area of pasture land near the farmstead, has been increased from zero to 85 percent since April 1935.

Dalhart. On more than 3,300 acres, crops have changed from clean-tilled cash crops that provide little cover for the land, to grass or sudan or some other close-growing crop that protects the soil from the sweep of wind. Here and there—somewhat surprisingly, on the Plains—young trees are thriving (Figure 31), giving promise of full growth and future land protection in the form of barriers against the wind. They have been planted carefully where the scant moisture concentrates in natural depressions or where the ingenuity of a land operator has caused it to concentrate. Cooperating farmers in the area no longer overgraze their stubble fields nor do they burn off the crop residues that anchor the soil during the windy months.

Case Results at Dalhart

The effectiveness of these new agricultural practices can be measured best by the results they have given. Cooperating in the Dalhart demonstration are 48 farmers owning a total of 28,000 acres of land.

One of them will harvest 1,000 pounds of headed milo-maize this year from a field that was photographed only one year ago as the worst wind-blown tract in the area (Figure 47). This field was terraced in April 1936, and in May plowed along the contour. Late in May and early in June, 5.24 inches of rain fell. Held evenly on the land by the terraces and contoured furrows, the rain penetrated the soil below the normal depth of root growth. Since these spring rains, only 2.44 inches of effective moisture has fallen on the field, but the total, 7.68 inches, caught and forced into the soil, has been sufficient, even in a drought year, to produce a profitable grain crop (Figure 48). That same crop, of course, also will batten down the soil against the wind. It is the first time this field has produced a crop since 1933, and the first time since then that the "blow season" has found it covered with a protecting cloak of vegetation. Of the contour furrows and terraces, the owner says: "Not a drop of water ran off the field this year." That means all of it went into the soil, and water in the soil—even as little as 7 or 8 inches—means a crop. This field is not likely to be used again as an example of blown out land.

Another cooperator in the Dalhart area for two years has farmed his land on the contour. In this year of drought he got a good crop of grain sorghum with only 8.71 inches of rain, which is only 56 percent of normal.

These farmers are only two of the 48 cooperators in the Dalhart demonstration. But what they have done is not exceptional—on the contrary, it is typical of the results obtained by all of the cooperators.

Northern Plains

The first soil conservation demonstration in the northern sector of the Plains was established at Huron, Beadle County, South Dakota, in February 1935. Comprising a total of 190,000 acres, the project is situated on the plains of the James River in the glacial drift section of the State.

Wind erosion is the principal immediate problem in the area. The most severe drought on record for the region was that of 1936, although in 1934 conditions were almost as bad. This has made emergency control measures for holding or stabilizing the soil—especially the loose sandy types—a pressing need.

Eight water conservation dams have been built in the area by Civilian Conservation Corps enrollees under the direction of the Soil Conservation Service. When the surface-water supply was augmented by springs or wells, some of these reservoirs supplied water for livestock and other purposes throughout the 1936 drought.

Eighty-five miles of contour furrows and approximately 17 miles of terraces have been constructed in the area. They were ready to catch the first winter snow early in November 1936—the first precipitation since February 1936. The snow melted within a fortnight, and almost all of the resulting water sank into the soil as storage for the next year's grass and crops.

The chief emergency control steps taken in the area have been rough tillage, mostly listing, and the production of emergency crop and feed cover, notably rye, cane and sudan grass.

This project also is only one of the 55 similar projects under way throughout the Plains Region. Comparable work has been done in four other areas in South Dakota, four in North Dakota, three in Montana, one in Wyoming, seven in Nebraska, twelve in Colorado, six in Kansas, six in Oklahoma, ten in Texas, and one in eastern New Mexico.

Conservation Associations

General interest in soil and water conservation has increased in the Great Plains Region as a direct result of the demonstration program of the Service. In the last year, fifty-three voluntary Soil Conservation Associations have been formed by farmers and ranchers of the Region to promote the adoption of better land-use practices through concerted community effort. Organized usually on a county basis, these Associations have memberships ranging from about 12 to as many as 400 landowners and operators. Their objective is to promote the conservation and better use of soil and water resources in the Great Plains.

The Bowman-Slope Association in North Dakota, with approximately fifty members representing some 40,000 acres of land, for example, has adopted a program calling for: (1) the construction of small dams on individual farms to enable the farmer to irrigate small tracts of land

FIGURE 43.—*Tilling on the contour conserves rainfall and impedes the sweep of wind.* (Soil Conservation Service photo.)

FIGURE 44.—*Contour furrows on grass land conserve water and increase growth.* (Soil Conservation Service photo.)

FIGURE 45.—*Surface storage reservoirs supply needed water for stock and for flood irrigation.* (Soil Conservation Service photo.)

FIGURE 46.—*Air view of a bad gully being brought under control by contour plowing and strip cropping.* (Soil Conservation Service photo.)

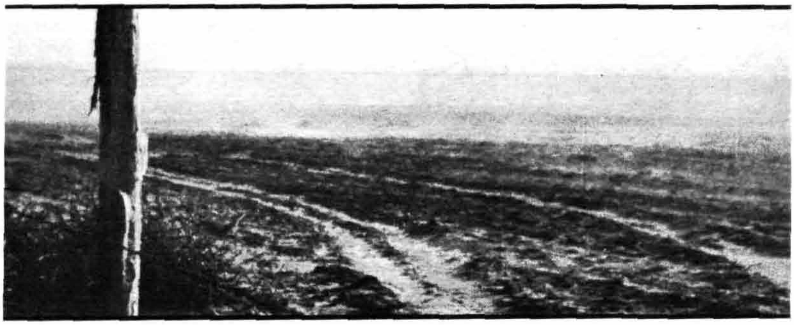


FIGURE 47.—*The worst wind-blown tract in the Dalhart, Texas, area in 1935.* (Soil Conservation Service photo.)

FIGURE 48.—*The same tract as in Figure 47 one year later after contour plowing and terracing.* (Soil Conservation Service photo.)

for the production of garden crops, potatoes, and, where feasible, farm crops; (2) the reduction of farm tenancy to expedite the adoption of improved practices to reduce erosion and conserve rainfall; (3) the establishment of centers at which improved practices will be demonstrated; and (4) assisting farmers in obtaining grass seeds for reseeding abandoned crop lands. With modifications in detail, the programs adopted by all of the Associations are similar.

Actual Results

There is no better measure of the effectiveness of soil and water conservation in the Great Plains than the results obtained thus far. The cases which follow are typical:

1. In the northern Plains a number of rainfall-retention dams have been built near small towns by Civilian Conservation Corps enrollees under the direction of the Soil Conservation Service. Despite severe drought, wells supplying these towns with water were completely adequate throughout the past summer. There was no serious shortage of water, for example, in the North Dakota towns of Valley City, LaMoure, Park River (Figure 30), Sentinel, Butte, Bowbells, Rolla, and Northgate, where dams had been built. Farmers also reported that the depth of water in their surface wells increased considerably after nearby storage reservoirs filled with water. The only reasonable explanation of such stabilized water conditions is that water from the reservoirs supplemented the supply in the wells by a process of seepage through alluvial sub-strata.

In Kansas, ten Civilian Conservation Corps camps have been used by the Soil Conservation Service since April 1, 1935, in constructing several large earth-fill dams for the storage of rainfall. Three dams with a total storage capacity of 1,855,000,000 gallons have been completed. Seven others with a total storage capacity of 7,638,000,000 gallons are under construction. They will develop lakes for water supply, recreation, wildlife, irrigation, and other purposes.

2. In 1934, the Soil Conservation Service built a timber crib dam with a storage capacity of approximately 100-acre feet on the Wild Rice River immediately upstream from Fargo, North Dakota. During 1936, a rubble masonry dam with a potential storage capacity of 380-acre feet was constructed on the Red River, 15 miles upstream from Fargo. There is now being constructed an eight-foot rubble masonry dam on the Red River immediately above Fargo, which will store approximately 400-acre feet of water. Together, the dams provide a potential storage of 880-acre feet of water, which will be available to the city during periods of extreme drought. The critical conditions involved can be explained somewhat in records of the Red River, which is reported to have had no flow at Fargo on 584 days between July 25, 1932, and June 14, 1936.

3. The Service built a small dam eight feet high on a farm near Bismarck, North Dakota, to conserve water for stock. During the drought, water from this little reservoir irrigated 42 acres, and on this land enough hay was produced in 1936 to feed through the winter 53 head of livestock, including 10 milk cows. Corn, potatoes, carrots, tomatoes, cream, chickens, and eggs were sold by the farmer. The intelligent use of water conserved in this small farm reservoir made the drought a matter of much less concern to this farmer than to his neighbors.

4. (From *The Montana Farmer*, November 1, 1936) "Development of stock water reservoirs, flood water irrigation reservoirs, springs and seeps, and diversion dams for irrigation by the Soil Conservation Service in eastern Montana counties clearly demonstrates the possibility of getting water on thousands of acres of good pasture or meadow land and providing water for livestock operations.

"Starting August 6, the Soil Conservation Service, under the direction of E. H. Aicher, State Coordinator, has developed 49 strictly stock water dams, 39 stock water and flood irrigation dams, 16 spring developments, and 10 contour furrowing projects.

"The dam constructed strictly for flood irrigation and those for stock water and flood irrigation give a total of 55 dams from which water will be used for flooding good range land, which eventually will be in alfalfa. A total of 1,730 acres will be flood-irrigated from these 55 dams.

"There are 17 project areas in nine counties, according to Mr. Aicher. A total of 65,575 acres is involved under cooperative agreements worked out between the farmers and the Soil Conservation Service. There are three project areas in Fergus, two in Judith Basin, two in Rosebud, two in Custer, one in Powder River, two in Wibaux, three in Fallon, one in Carter, and one in McCone.

"Approximately 365 acres can be irrigated from projects in Fergus County, 40 in Judith Basin, 90 in Rosebud, 85 in Custer, 430 in Powder River, 400 in Wibaux, 100 in Fallon, 80 in Carter, and 130 in McCone.

"While this program of the Soil Conservation Service is for demonstration purposes, it shows the possibility of extensive water conservation development in areas affected by drought. With favorable weather conditions all the projects will be completed by the first week in November.

"A unique feature of this program is the fact that farm labor has been used almost 100 percent. The men were made available to the Soil Conservation Service through the Works Progress Administration. In the neighborhood of 1,500 farmers were employed and approximately 75 percent of these used their own teams of horses."

4. (From *Western Farm Life*, June 1, 1936) "Last month

Prowers and Baca Counties, in southeastern Colorado received the first real precipitation since September 1935. The amount of rainfall varied from 1.05 inches at the Springfield C. C. C. camp to 2.33 inches 18 miles west of that town. The welcome moisture fell within a 24-hour period, and all roads excepting the two main highways became impassable.

"The much-needed water thoroughly tested the moisture-conserving devices constructed by the Soil Conservation-C. C. C. camp in the Springfield area. The morning following the rain found most of the dams full of water with evidences of a slight flow over the spillways. It was interesting to note that one dam which had as its watershed a field listed on the contour, contained very little water as the contour-listed rows had retained the moisture as it fell, allowing it to penetrate the soil and thereby resulting in a negligible amount of runoff.

"Contour furrows held up very well, the value of cross dikes being clearly demonstrated. In a few cases where the dike had broken, cross dikes retained the water in the adjacent sections, avoiding general breaks in furrows below.

"All terraces and diversion ditches stood the test and in no case did the depth of water appear to be more than one-third of the maximum that could have been retained. In all instances, the areas between the terraces had been listed either before or after terrace construction.

"Pocket structures designed to catch water for tree planting functioned well. In that territory such structures are necessary to provide additional moisture for young trees planted.

"Only 10 days after this heavy rain, a severe duster swept adjacent areas. This was attributed to the fact that on land where no soil-conservation practices are in effect, the runoff was as high as 90 percent, instead of the water being held and allowed to store moisture and anchor the loose soil.

"This was the first important test of some of the wind and water erosion prevention practices being advocated and demonstrated by the Federal Soil Conservation Service. The results are not only gratifying to the Service, but are encouraging to landowners, who are planning to carry out similar soil retaining practices on their own ranches."

6. During the past year the Soil Conservation Service has cooperated with the Montana State Water Conservation Board in the development of two large storage reservoirs, known as the War House and Yellow Water projects. The War House project involves the construction of a supply canal approximately three miles in length to divert water from Ford Creek to a natural reservoir with a potential storage capacity of 19,000 acre-feet. The water is to be used to irrigate approximately 5,000 acres of land for alfalfa production. The State Board is supplying equipment and materials for this project and assumes all responsibility for the irrigation system which will be developed in the future. The Yellow Water project consists of a large storage reservoir with an earth dam. The dam will contain 125,000 cubic yards of fill and will store 5,000 acre-feet of water for irrigating 2,000 acres for alfalfa production.

In addition to work on these two water storage projects, a small demonstration of flood irrigation on the Johnson farm east of Winnett is nearly complete. This project involves the diversion of run-off water from a coulee to an alfalfa field where it is to be spread by a series of contour dikes. Control gates will be so placed with respect to the contour dikes as to give a fairly even distribution of water. This system of flood irrigation will enable the operator to produce from one to three crops of alfalfa per season on a 40-acre field.

7. Near Mexican Springs, New Mexico, an earthen dam was thrown across an actively eroding arroyo to divert the water out over adjacent flats, formerly essentially bare of vegetation because of overgrazing. The result in 1935 was a splendid growth of grass over some 300 acres and a production of corn yielding up to 60 bushels an acre on an additional 200 acres. Equally good results were obtained in 1936.

This simple method of utilizing water that formerly ran to waste down the arroyo accomplished four distinctly useful things. It provided protection and moisture for the rich lowland soil that was being cut away by the expanding gully; it held back silt which otherwise would have been discharged into Boulder Reservoir; it provided food for the needy Navajos and feed for their livestock; and in providing additional stock feed it afforded a measure of relief to overgrazed highlands upstream.

Also at Mexican Springs, several earth dams were built by the Soil Conservation Service to conserve and spread rain-water. In June 1935, studies were started to determine the effect of flood irrigation on the native range grasses. Following the summer rains, grasses on six flood-irrigated test plots showed an average increase of 49.4 percent in density; the volume of grass was increased ten times.

Conclusion

The virgin Plains have been described in print and by word of mouth as a land of grass, its soils secure beneath the protective mantle thrown over them by nature. Figures 10, 11 and 12, photographs of the range taken in 1870, present a striking visual description of the Plains Region as it appeared prior to occupation by man. In contrast, Figures 23 and 24 show the denuded and desolate conditions of today.

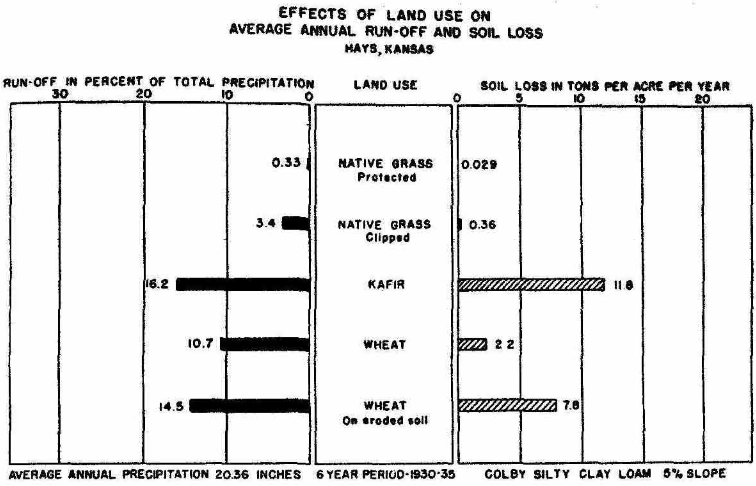


FIGURE 49

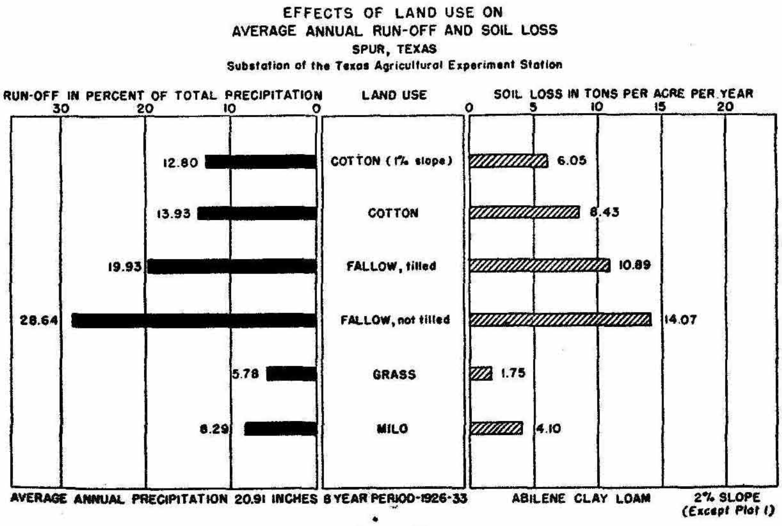


FIGURE 50

Appendix 4

BENEFITS DERIVED BY AREAS SURROUNDING IRRIGATION PROJECTS

The Bureau of Reclamation of the United States Department of the Interior, in a letter to the Committee, has made the following statement:

"There can be no question concerning the efficacy of irrigation, where it is practicable, in solving the problems created by drought, not only of the acreage immediately under the canals, but also of a considerable area surrounding the watered land. The evidence presented by the Federal projects at Belle Fourche, South Dakota, and on the North Platte River in Wyoming and Nebraska, is conclusive in this respect. These areas prospered during both the drought of 1934 and that of 1936, although they were in the heart of the region hit the hardest. They bolstered the livestock industry in their localities by providing feed and a market for feeder stock. They supported urban communities and paid taxes in support of local governments and schools. They provided labor and had little or no relief requirements of their own. In addition, they supported such notable industries as sugar factories and the like, with consequent additional opportunities for employment.

"The Belle Fourche project, while it suffered a shortage of water for irrigation due to the cumulative deficiency of the past several years, produced crops in 1936 of a value of $21 per acre and of a total value of $777,000. In 1935 a total of 46,081 acres was irrigated in the Belle Fourche project, producing crops valued at $1,026,675 or $24.11 per acre. The water shortage of 1936 forced a reduction in the acreage irrigated to 37,000 acres.

"The valuation of the land of the Belle Fourche project for taxation purposes is $30 per acre. The valuation of the dry land surrounding this project for taxation purposes is $4.50 per acre. The return from the irrigated land this year was $21 in comparison with 10¢ per acre for the dry land. At their valuation on the tax rolls the 60,500 acres on the Belle Fourche project represent $1,815,000. In addition, irrigation here sustains livestock holdings valued at $1,100,000 and city property and utilities valued at $941,000. Adding an item for personal property estimated conservatively at $500,000 the Belle Fourche project sustains taxable property valued at $4,356,000. These values have been created by the project as have those communities dependent upon them. That this is so is demonstrated by the fact that except for inland post offices there is no town nor settlement within 120 miles north of the project, within 90 miles northeast of the project, and within 150 miles east of the project. This section is primarily a range country and the livestock industry within a range of 50 miles of the project is dependent to a large extent upon the products of irrigation at the Belle Fourche project. No hay of consequence was cut on the dry land in 1936 and the livestock holdings were reduced by 75 percent as a result of the drought and water shortage. The remaining 25 percent is being wintered on the project or on the hay and feed produced by irrigation of the project lands.

"The North Platte project has made similar contributions. The Goshen Irrigation District, with headquarters at Torrington, Wyoming, a part of the North Platte project, produced on 42,494 acres in 1935 crops valued at $1,288,419. In 1936 the acreage and the crop values were approximately the same despite drought conditions in surrounding areas. Lands of this District had an assessed valuation of $30 per acre, while the non-irrigated farm lands surrounding have an assessed valuation of $2.35 per acre. During the past five years the value of crops on the surrounding non-irrigated land has averaged less than $3. The Goshen District has supplied both labor and food for its own population and that of the surrounding territory. In addition it has supported the livestock industry of the dry areas of Goshen County."

* * * *

"The Pathfinder Irrigation District, of Mitchell, Nebraska, a part of the North Platte project, irrigates about 193,000 acres in Scotts Bluff County which has a total of 432,000 acres. Of the remainder about one-fifth is dry farmed and the balance used for pasture. . . . At least 80 percent of the population of the County derives its income directly or indirectly from irrigation farming. The only manufacturing is that of locally grown products. Five sugar beet factories, dependent

upon products from irrigated land, represent an investment of at least $5,000,000 and employ 1,500 men during the season they operate. In 1936, 25,000 head of cattle and 400,000 head of sheep were fattened on lands of the Pathfinder District. This stock was obtained from the hard-pressed stockmen of ranges in Nebraska, Wyoming and Montana. *In addition more than 9,000 cars of* potatoes were shipped from the District in 1936."

Appendix 5

THE MONTANA LAND-USE STUDY[1]

Illustrated by a Representative Sector of Fergus County

Generalized maps afford only an over-all picture of a region. Any selected area within a region is likely to present many variable factors which do not appear on a generalized map but which must be understood in order to plan soundly for better use of the land.

In order to illustrate briefly a program for improved land use, from the assembling and weighing of facts to the planning of desirable changes and adjustments, material is presented here from a recent land-use study of the State of Montana. This material pertains to an area in Fergus County, central Montana, which is representative of the entire State, in many ways of the whole northern Great Plains Region.

This sector was chosen in order to obtain fair samples of types of land and methods of land use found throughout the Region. The Fergus County area has all classes of farm land, from excellent to poor. Its topography is varied and it affords examples of the three major types of operating units found in the Region: farms, ranches, and combination units. As elsewhere in the northern Great Plains, the problem to be considered is a dual one, involving land conservation and the betterment of human living standards.

People within the area realized that they faced serious adjustment problems. Erosion was general and increasing; the grass cover was depleted to an extent which could not be charged entirely to climatic conditions. There was considerable abandonment of farm land. Tax delinquency constituted an increasing worry to public officials, and tenancy was on the rise. Operating units, most of which were originally 160 and 320 acre homesteads, had increased in size, and the amount of land over which no effective control is exercised had grown rapidly. Emergency assistance, in the form of seed loans, drought purchase of livestock, feed loans and the like, was increasingly necessary. Some standard was needed for measuring the extent of the problem, the factors causing distress, and the adjustments needed to correct the situation.

[1] By Ray B. Haight, Land-Use Planning Specialist for Montana, Resettlement Administration.

No further evidence was required to show that the area selected was definitely in need of some economic rehabilitation, but much additional information was needed before the actual problems could be measured intelligently and adequately understood, and before a sound basis could be established for future change. The development of the requisite information proceeded about as follows:

First, facts were assembled to show the present use of the land and the economic conditions which had resulted therefrom. Second, these facts were correlated in order to show the relative importance of factors responsible for the present distress. Finally, with this information in hand, it was possible to estimate adjustments which should be made to correct destructive processes and to set up the basis of a stable agriculture and a desirable community life.

Much of the material used in this study was already available in statistical form. What was necessary was to relate these facts one to another and to land conditions by coordination and analysis and by representation on maps. In some instances, supplementary information had to be assembled. In other instances, lack of facilities and lack of time made it necessary to do without certain data which would have been extremely helpful but which could be estimated somehow from secondary sources. For example, there has been no mapping of farm abandonment. This factor, known to exist, was confirmed to some extent by maps which showed relatively few farms in areas that were settled more thickly in earlier years.

The maps and charts prepared from existing statistical material or based on new data may be grouped in three categories. First are those showing physical data: topography, land classification, availability of water, and erosion. Second are those showing the present management of land: size and type of units, tenure and debt, and the like. Finally, there are several miscellaneous factors, including alternative economic opportunities, availability of markets, population characteristics, risk factors, community costs, etc. A complete list of the

maps and charts prepared appears at the end of this appendix. The first six maps that are reproduced represent material that has been particularly important in the present study.

Map 1 shows topography as a factor in the community pattern, in the location of rivers and intermittent streams, railroads, improved and other roads, telephone lines, etc. As a rule, the purely physical factors are of less importance than the economic and social factors which have arisen from the human use of the land.

Map 2 presents the land classification by the Montana Experiment Station and the United States Bureau of Chemistry and Soils, and is an important guide in determining the size of units and the types of production that are possible from a purely physical viewpoint.

Map 3 shows the present use of land in farms, distinguishing crop land, idle crop land, and pasture. It also visualizes the present community pattern, and gives some idea of the process of abandonment within these farms.

Map 4 shows the ownership of the land in 1934, according to four classifications: *resident ownership* refers to owners who reside within the State; *non-resident ownership* relates to owners who reside outside the State; *corporate ownership* is applied to corporate groups not actively engaged in agriculture, in most instances credit agencies; *governmental ownership* includes Federal, State, or county ownership.

Map 5 shows the tax status of land. This factor must usually be coupled with land tenure before it brings out significant aspects of the problem.

Map 6 shows operating units within the area,[2] classified into three groups by gross income. Those units in group one have an annual gross income of $1,000 or less; those in group two, $1,001 to $2,000; and those in group three, more than $2,000. The dominant type of operation is also indicated on this map. Type 1 includes those units deriving two-thirds or more of their income from cash-grain crops; type 2 comprises combination cash-grain and livestock units; and type 3 consists of units in which two-thirds or more of the income is derived from livestock.

Considerable importance is attached to the factor of ownership. This is particularly true of land in what may be termed "unwilling ownership"—i. e., tracts acquired by the county through non-payment of taxes, or obtained by corporate owners as a result of mortgage foreclosures, or held by absentee owners who have abandoned their homesteads. Such land is apt to receive little care or control. Together with scattered tracts of public domain, it comprises the bulk of the unleased and uncontrolled land that falls prey to the sheep or cattle of competitive users, who have no interest in its conservation. As a result, these tracts are quickly overgrazed and shortly become "sore spots" of wind erosion and weed breeding.

It is supposed by some that free use of unleased lands is an advantage to the small operator. A study made by the State College of Montana some years ago revealed that the existence of this cheap, unwanted land was responsible for various burdensome costs to small operators and large operators alike. The scramble for the use of these tracts brings on excessive competition, forcing an operator to sell his stock in poor years on a low market. It militates against the improvement of stock, and involves a high risk for the operator who depends upon this pasture. Labor costs are also likely to be relatively high for those who count upon this land.

The need for assembling so wide a variety of data as indicated is due particularly to the fact that without them it is impossible to judge accurately the relative importance of the several factors considered. Within even so small an area as that covered by this illustrative discussion, each factor studied may have great importance in some places and little or no importance in other places. Consider, for example, the factor of land ownership. Correlation of the ownership pattern with other data reveals that in those portions of the area having the *more productive* classes of crop and grazing land, ownership does not indicate the major changes necessary. On the other hand, the ownership pattern on lands of *lower productivity*, when related to other data, does give a definite indication of some of the basic adjustments that are required. The same thing is true of a relatively less important factor, such as the length of frost free periods. In portions of the area where the dominant type of operation involves the production of hay and livestock, the frostless period is of comparatively little consequence. It assumes far more significant proportions in localities which produce beans, corn, and garden crops.

To attempt to describe systematically the process of correlating the many factors included in this study would be like trying to outline a process for putting together the pieces of a jigsaw puzzle. In the case of this study, moreover, there is the added complication that each time a new "piece" or factor is brought in, it changes the relative size and shape of every other piece. As an example, take the factor of tax delinquency. Frequently tax delinquency is an indication of the uneconomic use of land. In many instances, however, correlation of this factor with other factors reveals a very different situation. When correlating data as to ownership and type of operating unit with tax delinquency on certain tracts in central Montana it will be found that the delinquent lands are locally owned grazing units. Certain paid-up tracts nearby will be found to be absentee or corporate owned land, much of which also will be found to be abandoned

[2] This map is considered to show at least 95 percent of all units.

or idle. These findings indicate that the payment of taxes on these tracts bears little relation to the condition of the land; taxes have been paid for the most part with funds received from sources outside of the land itself and have been paid, moreover, to satisfy bookkeeping requirements or other purposes not related to the use or character of the land. By consulting additional data, it is found that the paid-up tracts are suffering more severely from wind erosion than the delinquent tracts, that there has been general depletion of their grass cover, and that they contain land largely in the lower classifications.

Digging still further into available records, a complete story finally is uncovered that provides an understandable background for the condition that has been noted. Originally the lands around waterholes and along streams were taken up by large cattle outfits, which used the adjoining areas of public land as additional range. In 1910, or thereabouts, a rapid settlement brought homesteaders into the area, who took up the bench lands for grain-farming purposes. The consequent restriction of free grazing opportunities for the cattlemen necessitated their assuming heavier costs in raising winter feed, and in leasing or purchasing additional range land. Gradually these costs became unbearable, and the cattle operators found themselves unable to meet their tax payments. At the same time, the grain farms established by homesteaders also fared poorly. Farms were heavily mortgaged, and as conditions proved steadily unfavorable to crop farming, the land fell into the hands of the mortgage holders. Abandonment soon followed, leaving the lands to be used by the cattlemen for unrestricted, competitive grazing. Further destruction of the grass and further erosion of the soil were the inevitable consequences. Yet all the time, because of outside influences, the taxes on these bench lands were paid up.

Having thus arrived at a true conception of the conditions prevailing on these lands—conditions which proved to be far different from what first appearances might have led one to suppose—it became possible to plan readjustments that would restore successful methods of land use to this badly stricken area. In some instances, the procedure has been to encourage larger units with a view to making grain farming possible. In other and more numerous instances, the best use of the land has appeared to demand the restoration of grazing. The proper decision depends in part upon the further correlation of a number of factors, such as crop yields, meteorological data, economic conditions, the community pattern, and the like.

The most significant point to be made is not that tax delinquency data are sometimes misleading. It is, instead, the fact that no one-dimensional approach to the measurement of land problems can succeed. Every possible factor must be examined in order to avoid subtle pitfalls of error. The trail of truth leads around many unexpected corners.

It is clear that the process of complete correlation for the whole Fergus County area and for all the factors involved therein is a long one. But when it is complete, it provides as sound a basis for planning as can be had. The results of these correlations are shown on the last map, No. 7, which indicates the probable best uses of land in the selected area—best for a stable economy that will yield a continuing income to the inhabitants. It should be noted that within each township in which both cash grain and livestock farming are present, the ratio of black to white indicates the relation between these two types within the township as a whole, but not the actual areal distribution of these types within the township.

Where physical factors and present conditions of use point to the desirability of continuing grain farming along present lines, this has been indicated. In many cases, the correlation of present-use data with the relevant physical factors indicates the need for larger operating units to allow for better crop rotation. In other portions of the area correlation shows that physical conditions leave the land on the margin of use for grain farming or grazing. In such instances it may be purely economic factors which throw the decision as to use one way or the other. Here one may see the importance of those varying factors which were pointed out above in the case of the ownership pattern and the frost free period.

On the basis of numerous correlations the following methods of improving land use for the area under study have been suggested:

1. A reversion of land from crops to permanent pasture, particularly in portions of the area having land of lower classifications.
2. Better use of water, through irrigation, retardation of run-off, and development of storage facilities.
3. Increase in the size of operating units, with respect to both cash-grain and cattle units. Larger pasture facilities are particularly necessary.
4. Encouragement of better farm practices, including rotation of tilled crops with grass, dam listing, contour furrowing, etc.
5. Changes in the policies governing credit and taxation.
6. Adjustment of farm debts.

A significant check upon the results of this multiple approach to the determination of land problems and to their solution is given by the last step in the process followed; namely, discussion of the proposed changes with local residents—farmers and ranchers living in the area. It has been found that the more intelligent operators everywhere in Montana have shown a noteworthy aptitude for understanding the basis for this type of study,

and the conclusions reached. Perhaps this aptitude is due to the fact that these men are accustomed to consider numerous factors in relation to a given piece of land, and have not, like so many specialists, confined their observations to a single aspect of their land problem.

The unity of this study lies in the area itself, not in any one subject matter. The unity of land problems in the mind of a farmer or rancher is the land which he has tried to handle successfully year after year in the face not of one difficulty, but of all difficulties. There is a corresponding multiple approach for investigators, and it has been gratifying to note the great extent to which the specific proposals made as a result of this correlated survey have been approved by men on the land whose judgment was based entirely on their own first hand experience.

TABLE A.—*For the area: North of line between townships 17 and 18, west of line between ranges 23 and 24, and east of, but including 2 eastern tiers of sections in range 15*

		Percent of total	Accumulative percent
Total all yield classes:			
Operators	[1] 362	100.00	100.00
Acres wheat seeded	60, 818	100.00	100.00
Bushels wheat harvested	641, 685	100.00	100.00
0–2.49 bushels per seeded acre (1928–35):			
Operators	25	6.91	6.91
Acres wheat seeded	2, 861	4.70	4.70
Bushels wheat harvested	4, 479	.70	.70
2.5–4.99 bushels per seeded acre (1928–35):			
Operators	43	11.88	18.79
Acres wheat seeded	5, 144	8.46	13.16
Bushels wheat harvested	20, 945	3.26	3.96
5–7.49 bushels per seeded acre (1928–35):			
Operators	90	24.86	43.65
Acres wheat seeded	13, 491	22.18	35.34
Bushels wheat harvested	84, 225	13.13	17.09
7.5 and over bushels per seeded acre (1928–35):			
Operators	204	56.35	100.00
Acres wheat seeded	39, 322	64.66	100.00
Bushels wheat harvested	532, 036	82.91	100.00

[1] Includes stock ranches for which wheat records are in hand.

Tables A and B show the average eight years' record for the production of wheat in this area. If the sixty-eight farms averaging less than five bushels of wheat per acre had been seeded to grass crops, wheat production for the area for the period would have been reduced 25,424 bushels, or 370 bushels per farm. Since it took 8,000 acres to produce this wheat, the income was apparently not much more than the seed cost, in addition to which there were labor and marketing costs, interest, taxes, and family living costs.

TABLE B.—*Fergus County total* [1]

		Percent of total	Accumulative percent
Total all yield classes:			
Operators	1, 054	100.00	100.00
Acres wheat seeded	218, 129	100.00	100.00
Bushels wheat harvested	2, 526, 697	100.00	100.00
0–2.49 bushels per seeded acre (1928–35):			
Operators	43	4.08	4.08
Acres wheat seeded	6, 047	2.77	2.77
Bushels wheat harvested	9, 633	.38	.38
2.5–4.99 bushels per seeded acre (1928–35):			
Operators	84	7.97	12.05
Acres wheat seeded	10, 489	4.81	7.58
Bushels wheat harvested	42, 200	1.67	2.05
5–7.49 bushels per seeded acre (1928–35):			
Operators	188	17.84	29.89
Acres wheat seeded	33, 039	15.15	22.73
Bushels wheat harvested	207, 660	8.22	10.27
7.5 and over bushels per seeded acre (1928–35):			
Operators	739	70.11	100.00
Acres wheat seeded	168, 554	77.27	100.00
Bushels wheat harvested	2, 267, 204	89.73	100.00

[1] Includes stock ranches for which wheat records are in hand.

SUB-APPENDIX

A complete list of factors mapped in connection with the area study in Fergus County, Montana.

1. Geological Areas.
2. Soil Types.
3. Topography.
4. Streams and Watersheds.
5. Land Classification.

6. Percentage of Each Class.
7. Type of Farming Areas.
8. Problem Area by Type.
9. Land in Farms (Which Shows 1933 Land Use).
10. State Yield Map.
11. Acres of Wheat.
12. Bushels of Wheat.
13. Acres for all Major Crops.
14. Operating Units—Size and Production.
15. Livestock Classes and Numbers (obtained by correlating Forest Permits-Drought Purchase records, Assessor records—6000 RACC records and other counts).
16. Ownership Mapped in 4 classes (Statistically available in 15 subclasses).
17. Tax Status.
18. Public Service.
19. Population by Age Groups (Mapped in place).
20. Isolation Maps.
21. Subventions.
22. Mortgage Studies Mapped.
23. Precipitation and Temperature.
24. Heat Units.
25. Erosion.
26. Cover.
27. Cover Depletion.
28. Population Movement.

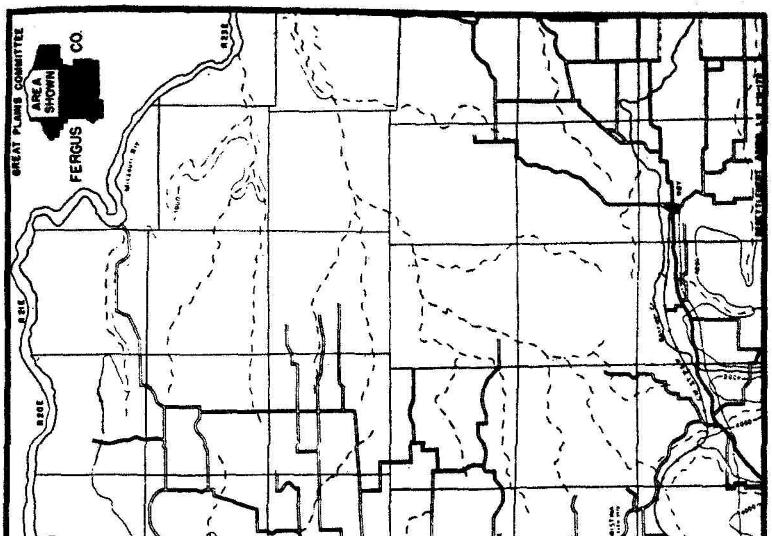

TOPOGRAPHIC MAP
IMPROVED ROADS
TELEPHONE LINES
UNIMPROVED ROADS
CONTOURS
RAILROADS
INTERMITTENT STREAMS
GREAT PLAINS COMMITTEE
AREA SHOWN
FERGUS CO.

FIGURE 51

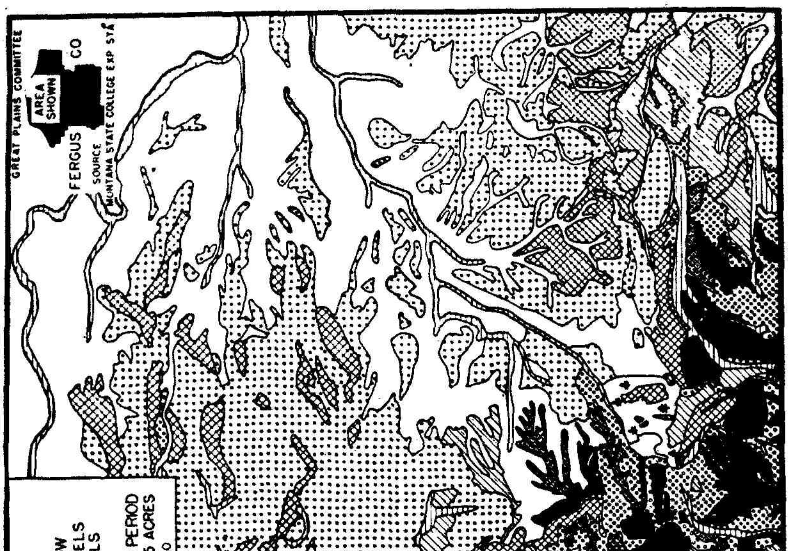

LAND CLASSIFICATION*
FARM LANDS
GRADED AS TO YIELD OF SPRING WHEAT ON SUMMERFALLOW
1,ST - 22 BUSHELS OR OVER
2,ND - 16 TO 21 BUSHELS
3,RD - 12 TO 15 BUSHELS
4,TH - 8 TO 11 BUSHELS
GRAZING LAND
GRADED AS TO ACRES PER 1000 LB. STEER FOR 10 MO'S GRAZING PERIOD
1,ST & 2,ND - 27 ACRES
3,RD & 4,TH - 27 TO 55 ACRES
5,TH & 6,TH - 56 ACRES OR MORE
*1930
GREAT PLAINS COMMITTEE
AREA SHOWN
FERGUS CO
SOURCE
MONTANA STATE COLLEGE EXP STA

Figure 52

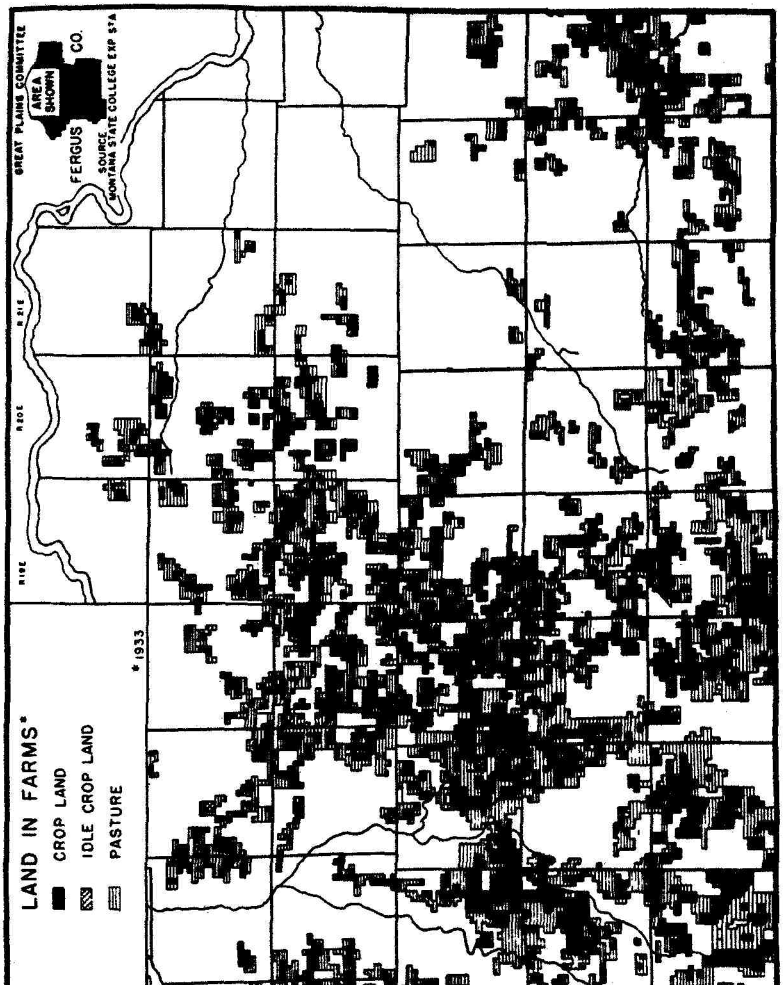

LAND IN FARMS*
CROP LAND
IDLE CROP LAND
PASTURE
* 1933
GREAT PLAINS COMMITTEE
AREA SHOWN
FERGUS CO.
SOURCE
MONTANA STATE COLLEGE EXP STA

FIGURE 53

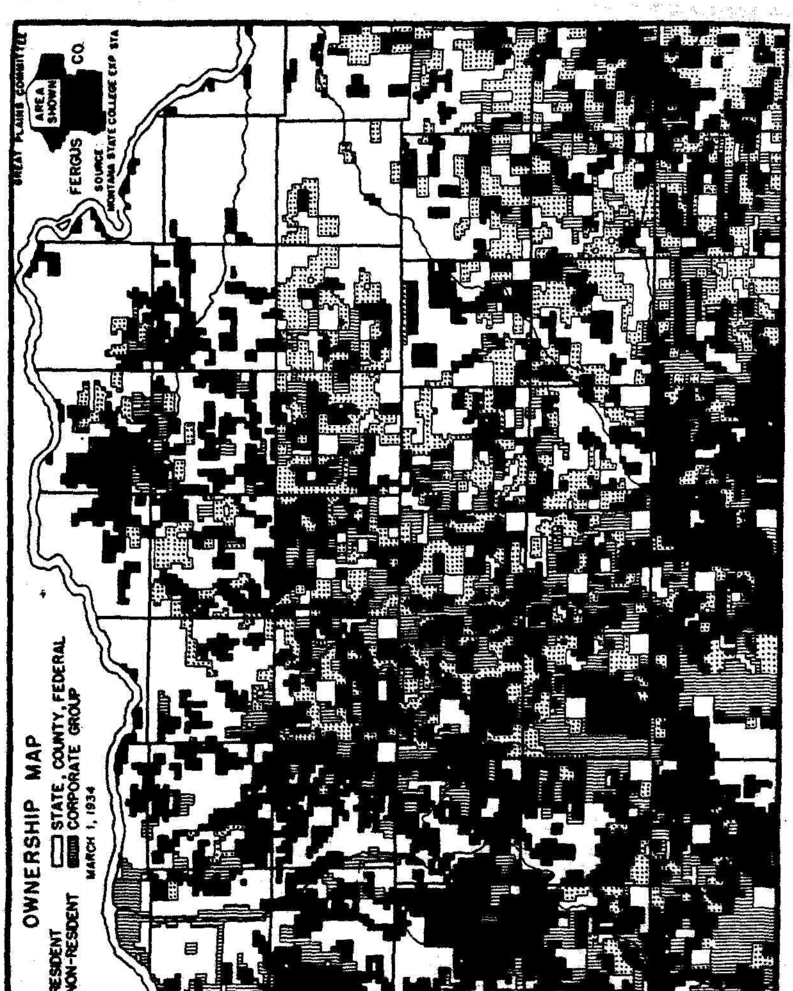

OWNERSHIP MAP
RESIDENT
NON-RESIDENT
STATE, COUNTY, FEDERAL
CORPORATE GROUP
MARCH 1, 1934
GREAT PLAINS COMMITTEE
AREA SHOWN
FERGUS CO.
SOURCE: MONTANA STATE COLLEGE EXP STA

FIGURE 54

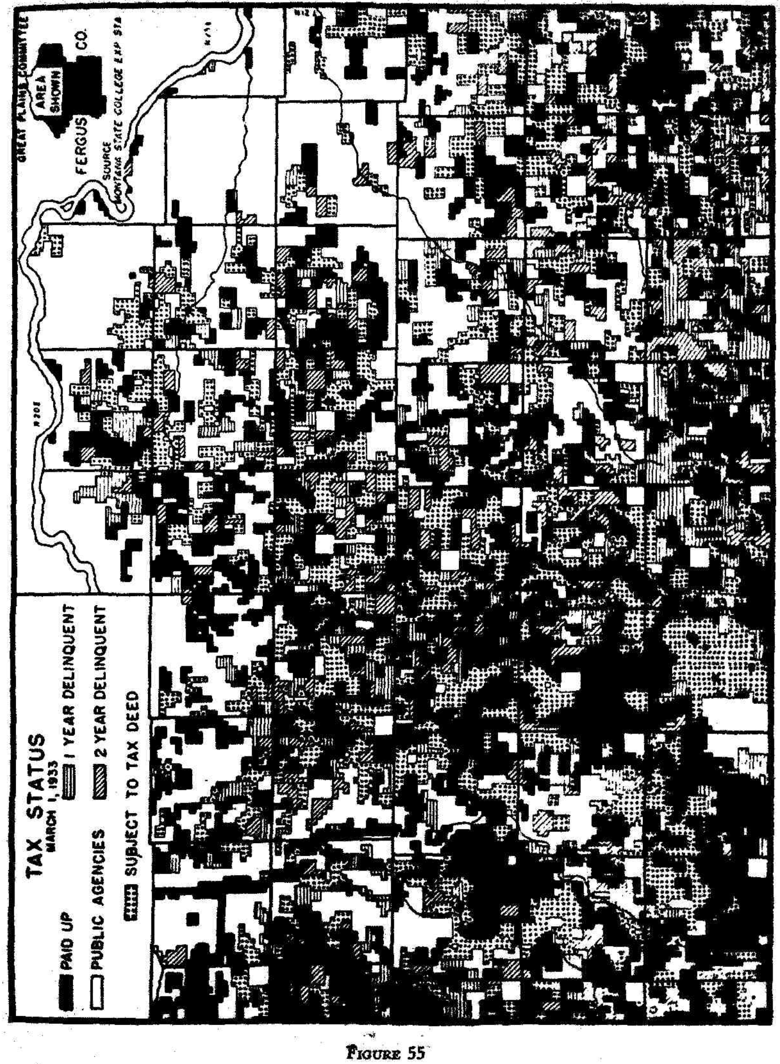

TAX STATUS
MARCH 1, 1933
PAID UP
PUBLIC AGENCIES
1 YEAR DELINQUENT
2 YEAR DELINQUENT
SUBJECT TO TAX DEED
GREAT PLAINS COMMITTEE
AREA SHOWN
FERGUS CO.
SOURCE
MONTANA STATE COLLEGE EXP STA
R20E

FIGURE 55

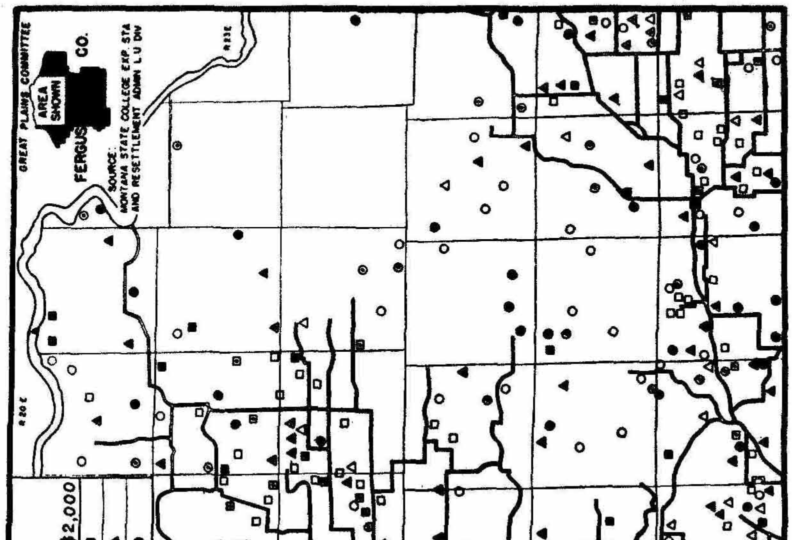

FARM INCOME BY UNITS
1936
TYPE OF FARM
$1,000-AND LESS
$1,001-$2,000
OVER-$2,000
WHEAT
COMBINATION
LIVESTOCK
GREAT PLAINS COMMITTEE
AREA SHOWN
FERGUS CO.
SOURCE:
MONTANA STATE COLLEGE EXP. STA.
AND RESETTLEMENT ADMIN. L.U. DIV.

FIGURE 56.

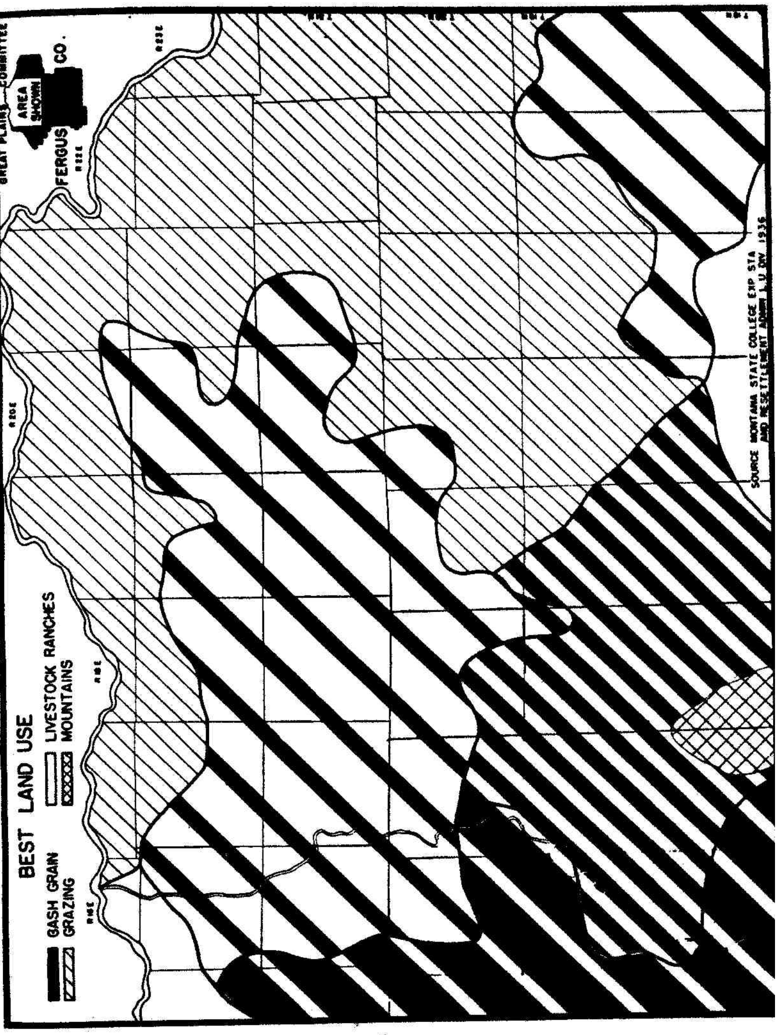

BEST LAND USE
CASH GRAIN
GRAZING
LIVESTOCK RANCHES
MOUNTAINS
GREAT PLAINS COMMITTEE
AREA SHOWN
FERGUS CO.
SOURCE MONTANA STATE COLLEGE EXP STA
AND RESETTLEMENT ADMIN L U DIV 1936

FIGURE 57

Appendix 6

A MONTANA COOPERATIVE GRAZING ASSOCIATION

The following excerpt from the Montana Experiment Station Bulletin Number 326, entitled "Grazing Districts in Montana: Their Purpose and Organization Procedure", is of interest as an illustration of the actual use of a cooperative grazing association for unified control of range land.

"This district[1] chosen for an illustration is one of the smaller districts, with the size of the ranches also smaller than the average. It shows the possibilities for cooperative land use planning and development where a genuine community of interest exists among the stockmen of a district. This district has twenty members. The organization data on lands are given in table 3.

"The ranch property of the members consists of 16,760 acres of owned range, 1,420 acres of hay and feed crop land, and 16,200 acres of leased grazing land. The average carrying capacity of the range lands of the district was estimated by the members at 20 head (animal units) to the section for an eight-month grazing season. Approximately 60 miles of fence are required to enclose the district, of which the association now owns about 15 miles. The type of fence being constructed is made with three lines of barbed wire on posts two rods apart with a stay between, which costs about $125 to the mile.

TABLE 3.—*Acreage of land in grazing district (summer range)*

Type of land	Acres	Acres leased by the Association	Cost per section
Public domain	320	--------	
State	4,080	3,560	Lease cost of $25 to $30.
Railroad	320	--------	
Non-resident	22,448	17,200	Tax average, $37.
Federal Land Bank	872	872	
County	15,640	15,040	Lease of $15.
Resident	640	640	
Total	43,720	37,312	

[1] The word "district" is used in this Bulletin to refer both to the association and to the land under control; this should be read with that in mind.

"There are four stock water reservoirs owned by members and the construction of 20 more is planned to afford better watering facilities and better use of the range. There are five springs, capable of furnishing stock water, which have been protected and improved.

"The water development plans are important for this district because like most of the cattle ranches of the plains region of the State, these are operating on a cow, calf, and yearling basis. When present water development plans are completed, no part of the range will be more than one mile from stock water.

"The Class One permits for 1,222 cattle and 96 horses absorb all of the carrying capacity of the range. The grazing fee per year has been set at $1.50 per animal unit. The individual data on permits issued is given in table 4.

TABLE 4.—*Individual data on permits issued*

Permit no.	Animal units—Class 1: Preference	Animal units—Class 1: Conditional	Permit no.	Animal units—Class 1: Preference	Animal units—Class 1: Conditional
1	44	19	11	13	23
2	32	9	12	50	50
3	40	10	13	20	33
4	33	....	14	37	45
5	77	18	15	3	54
6	28	18	16	5	65
7	51	12	17	40	71
8	19	37	18	166	46
9	9	30	19	34	29
10	19	....	20	119	13

"Class One permits are based on the number of livestock for which a ranch has feed production, including winter pastures, and the required history of prior use. This class of permit is further divided into preference permits for the winter feed rating of *owned* property, and conditional permits for the winter feed rating of *leased* property."

Appendix 7

A STANDARD STATE SOIL CONSERVATION DISTRICTS LAW

An act to declare the necessity of creating governmental subdivisions of the State, to be known as "soil conservation districts", to engage in conserving soil resources and preventing and controlling soil eroison; to establish the State soil conservation committee, and to define its powers and duties; to provide for the creation of soil conservation districts; to define the powers and duties of soil conservation districts, and to provide for the exercise of such powers, including the power to acquire property by purchase, gift, and otherwise; to empower such districts to adopt programs and regulations for the discontinuance of land-use practices contributing to soil wastage and soil erosion, and the adoption and carrying out of soil-conserving land-use practices, and to provide for the enforcement of such programs and regulations; to provide for establishing boards of adjustment in connection with land-use regulations, and to define their functions and powers; to provide for financial assistance to such soil conservation districts, and making an appropriation for that purpose; to declare an emergency requiring that this act take effect from the date of its passage, and for other purposes.[1]

[Enacting Clause.][2]

SECTION 1. SHORT TITLE

This act may be known and cited as the soil conservation districts law.

SECTION 2. LEGISLATIVE DETERMINATIONS, AND DECLARATION OF POLICY[3]

It is hereby declared, as a matter of legislative determination—

A. *The condition.*—That the farm and grazing lands of the State of ———— are among the basic assets of the State and that the preservation of these lands is necessary to protect and promote the health, safety, and general welfare of its people; that improper land-use practices have caused and have contributed to, and are now causing and contributing to, a progressively more serious erosion of the farm and grazing lands of this State by wind and water; that the breaking of natural grass, plant, and forest cover have interfered with the natural factors of soil stabilization, causing loosening of soil and exhaustion of humus, and developing a soil condition that favors erosion; that the topsoil is being blown and washed out of fields and pastures; that there has been an accelerated washing of sloping fields; that these processes of erosion by wind and water speed up with removal of absorptive topsoil, causing exposure of less absorptive and less protective but more erosive subsoil; that failure by any land occupier to conserve the soil and control erosion upon his lands causes a washing and blowing of soil and water from his lands onto other lands and makes the conservation of soil and control of erosion on such other lands difficult or impossible.

B. *The consequences.*—That the consequences of such soil erosion in the form of soil-blowing and soil-washing are the silting and sedimentation of stream channels, reservoirs, dams, ditches, and harbors; the loss of fertile soil material in dust storms; the piling up of soil on lower slopes, *and its deposit over alluvial plains; the reduction* in productivity or outright ruin of rich bottom lands by overwash of poor subsoil material, sand, and gravel swept out of the hills; deterioration of soil and its fertility, deterioration of crops grown thereon, and declining acre yields despite development of scientific processes for increasing such yields; loss of soil and water which causes destruction of food and cover for wildlife; a blowing and washing of soil into streams which silts over spawning beds, and destroys water plants, diminishing the food supply of fish; a diminishing of the underground water reserve, which causes water shortages, intensifies periods of drought, and causes crop failures; an increase in the speed and volume of rainfall run-off, causing severe and increasing floods, which bring suffering, dis-

[1] This title will be appropriate in most States. In many States it will be necessary to modify the title to conform with the local legislative practice.

[2] The form of the enacting clause is generally prescribed in the State constitution. An enacting clause should be supplied in conformity with the legislative practice.

[3] This section is important in announcing the constitutional basis upon which the legislation is predicated.

ease, and death; impoverishment of families attempting to farm eroding and eroded lands; damage to roads, highways, railways, farm buildings, and other property from floods and from dust storms; and losses in navigation, hydro-electric power, municipal water supply, irrigation developments, farming, and grazing.

C. *The appropriate corrective methods.*—That to conserve soil resources and control and prevent soil erosion, it is necessary that land-use practices contributing to soil wastage and soil erosion be discouraged and discontinued, and appropriate soil-conserving land-use practices be adopted and carried out; that among the procedures necessary for widespread adoption, are the carrying on of engineering operations such as the construction of terraces, terrace outlets, check-dams, dikes, ponds, ditches, and the like; the utilization of strip cropping, lister furrowing, contour cultivating, and contour furrowing; land irrigation; seeding and planting of waste, sloping, abandoned, or eroded lands to water-conserving and erosion-preventing plants, trees, and grasses; forestation and reforestation; rotation of crops; soil stabilization with trees, grasses, legumes, and other thick-growing, soil-holding crops; retardation of run-off by increasing absorption of rainfall; and retirement from cultivation of steep, highly erosive areas and areas now badly gullied or otherwise eroded.

D. *Declaration of policy.*—It is hereby declared to be the policy of the legislature to provide for the conservation of the soil and soil resources of this State, and for the control and prevention of soil erosion, and thereby to preserve natural resources, control floods, prevent impairment of dams and reservoirs, assist in maintaining the navigability of rivers and harbors, preserve wildlife, protect the tax base, protect public lands, and protect and promote the health, safety, and general welfare of the people of this State.

Section 3. Definitions

Whenever used or referred to in this act, unless a different meaning clearly appears from the context:

(1) "District" or "soil conservation district" means a governmental subdivision of this State, and a public body corporate and politic, organized in accordance with the provisions of this act, for the purposes, with the powers, and subject to the restrictions hereinafter set forth.

(2) "Supervisor" means one of the members of the governing body of a district, elected or appointed in accordance with the provisions of this act.

(3) "Committee" or "State soil conservation committee" means the agency created in section 4 of this act.

(4) "Petition" means a petition filed under the provisions of subsection A of section 5 of this act for the creation of a district.

(5) "Nominating petition" means a petition filed under the provisions of section 6 of this act to nominate candidates for the office of supervisor of a soil conservation district.

(6) "State" means the State of ....

(7) "Agency of this State" includes the government of this State and any subdivision, agency, or instrumentality, corporate or otherwise, of the government of this State.

(8) "United States" or "agencies of the United States" includes the United States of America, the Soil Conservation Service of the United States Department of Agriculture, and any other agency or instrumentality, corporate or otherwise, of the United States of America.

(9) "Government" or "governmental" includes the government of this State, the Government of the United States, and any subdivision, agency, or instrumentality, corporate or otherwise, of either of them.

(10) "Land occupier" or "occupier of land" includes any person, firm, or corporation who shall hold title to, or shall be in possession of, any lands lying within a district organized under the provisions of this act, whether as owner, lessee, renter, tenant, or otherwise.

(11) "Due notice" means notice published at least twice, with an interval of at least 7 days between the two publication dates, in a newspaper or other publication of general circulation within the appropriate area, or, if no such publication of general circulation be available, by posting at a reasonable number of conspicuous places within the appropriate area, such posting to include, where possible, posting at public places where it may be customary to post notices concerning county or municipal affairs generally. At any hearing held pursuant to such notice, at the time and place designated in such notice, adjournment may be made from time to time without the necessity of renewing such notice for such adjourned dates.

Section 4. State Soil Conservation Committee

A. There is hereby established, to serve as an agency of the State and to perform the functions conferred upon it in this act, the State soil conservation committee. The committee shall consist of a chairman and ——— members.[4] The following shall serve, ex officiis, as members of the committee: the director of the State extension service; the director of the State agricultural experiment station located at ———; ——— and ———.[5] The committee may invite the Secretary of Agriculture of the

[4] The number, which should be not less than 3, and probably not more than 5, should be here inserted.

[5] There should be here added the other State officials who are to serve as members of the committee, such as, possibly, the State conservation commissioner, if there is such an official; the State commissioner of agriculture, or similar official; a representative of the State planning board, if such a board has been created by statute or resolution of the State legislature. This list should, however, designate one member less than the total membership of the committee, to leave room for the Federal representative mentioned in the next sentence.

United States of America to appoint one person to serve with the above-mentioned members as a member of the committee. The committee shall keep a record of its official actions, shall adopt a seal, which seal shall be judicially noticed, and may perform such acts, hold such public hearings, and promulgate such rules and regulations as may be necessary for the execution of its functions under this act.

B. The State soil conservation committee may employ an administrative officer and such technical experts and such other agents and employees, permanent and temporary, as it may require, and shall determine their qualifications, duties, and compensation.[6] The committee may call upon the attorney general of the State for such legal services as it may require, or may employ its own counsel and legal staff. It shall have authority to delegate to its chairman, to one or more of its members, or to one or more agents or employees, such powers and duties as it may deem proper. It shall be supplied with suitable office accommodations at the seat of the State government, and shall be furnished with the necessary supplies and equipment. Upon request of the committee, for the purpose of carrying out any of its functions, the supervising officer of any State agency, or of any State institution of learning shall, insofar as may be possible under available appropriations, and having due regard to the needs of the agency to which the request is directed, assign or detail to the committee members of the staff or personnel of such agency or institution of learning, and make such special reports, surveys, or studies as the committee may request.

C. The committee shall designate its chairman, and may, from time to time, change such designation. A member of the committee shall hold office so long as he shall retain the office by virtue of which he shall be serving on the committee. A majority of the committee shall constitute a quorum, and the concurrence of a majority in any matter within their duties shall be required for its determination. The chairman and members of the committee shall receive no compensation for their services on the committee, but shall be entitled to expenses, including traveling expenses, necessarily incurred in the discharge of their duties on the committee. The committee shall provide for the execution of surety bonds for all employees and officers who shall be entrusted with funds or property; shall provide for the keeping of a full and accurate record of all proceedings and of all resolutions, regulations, and orders issued or adopted; and shall provide for an annual audit of the accounts of receipts and disbursements.

D. In addition to the duties and powers hereinafter conferred upon the State soil conservation committee, it shall have the following duties and powers:

(1) To offer such assistance as may be appropriate to the supervisors of soil conservation districts, organized as provided hereinafter, in the carrying out of any of their powers and programs.

(2) To keep the supervisors of each of the several districts organized under the provisions of this act informed of the activities and experience of all other districts organized hereunder, and to facilitate an interchange of advice and experience between such districts and cooperation between them.

(3) To coordinate the programs of the several soil conservation districts organized hereunder so far as this may be done by advice and consultation.

(4) To secure the cooperation and assistance of the United States and any of its agencies, and of agencies of this State, in the work of such districts.

(5) To disseminate information throughout the State concerning the activities and programs of the soil conservation districts organized hereunder, and to encourage the formation of such districts in areas where their organization is desirable.

SECTION 5. CREATION OF SOIL CONSERVATION DISTRICTS[7]

A. Any twenty-five (25) occupiers of land lying within the limits of the territory proposed to be organized into a district may file a petition with the State soil conservation committee asking that a soil conservation district be organized to function in the territory described in the petition. Such petition shall set forth:

(1) The proposed name of said district;

(2) That there is need, in the interest of the public health, safety, and welfare, for a soil conservation district to function in the territory described in the petition;

(3) A description of the territory proposed to be organized as a district, which description shall not be required to be given by metes and bounds or by legal subdivisions, but shall be deemed sufficient if generally accurate;

(4) A request that the State soil conservation committee duly define the boundaries for such district; that a referendum be held within the territory so defined on the question of the creation of a soil conservation district in such territory; and that the committee determine that such a district be created.

Where more than one petition is filed covering parts of

---

[6] Appropriate provision may be here made to conform with existing State civil service laws.

[7] It is true that in many States there now exist too many local governmental subdivisions. It is important, nevertheless, to provide for establishing soil conservation districts rather than to confer additional jurisdiction upon existing counties or other agencies. The most important consideration here relevant is the fact that this provision will permit inclusion within 1 district of all of the territory which should, for physical and economic reasons, be governed as a unit. It will probably be found desirable, in most cases, to include in a district parts or all of several counties, and in some cases it may be found appropriate to establish a district over an area smaller than a single county.

the same territory, the State soil conservation committee may consolidate all or any such petitions.

B. Within thirty (30) days after such a petition has been filed with the State soil conservation committee, it shall cause due notice to be given of a proposed hearing upon the question of the desirability and necessity, in the interest of the public health, safety, and welfare, of the creation of such district, upon the question of the appropriate boundaries to be assigned to such district, upon the propriety of the petition and other proceedings taken under this act, and upon all questions relevant to such inquiries. All occupiers of land within the limits of the territory described in the petition, and of lands within any territory considered for addition to such described territory, and all other interested parties, shall have the right to attend such hearings and to be heard. If it shall appear upon the hearing that it may be desirable to include within the proposed district territory outside of the area within which due notice of the hearing has been given, the hearing shall be adjourned and due notice of further hearing shall be given throughout the entire area considered for inclusion in the district, and such further hearing held. After such hearing, if the committee shall determine, upon the facts presented at such hearing and upon such other relevant facts and information as may be available, that there is need, in the interest of the public health, safety, and welfare, for a soil conservation district to function in the territory considered at the hearing, it shall make and record such determination, and shall define, by metes and bounds or by legal subdivisions, the boundaries of such district. In making such determination and in defining such boundaries, the committee shall give due weight and consideration to the topography of the area considered and of the State, the composition of soils therein, the distribution of erosion, the prevailing land-use practices, the desirability and necessity of including within the boundaries the particular lands under consideration and the benefits such lands may receive from being included within such boundaries, the relation of the proposed area to existing watersheds and agricultural regions, and to other soil conservation districts already organized or proposed for organization under the provisions of this act, and such other physical, geographical, and economic factors as are relevant, having due regard to the legislative determinations set forth in section 2 of this act. The territory to be included within such boundaries need not be contiguous. If the committee shall determine after such hearing, after due consideration of the said relevant facts, that there is no need for a soil conservation district to function in the territory considered at the hearing, it shall make and record such determination and shall deny the petition. After 6 months shall have expired from the date of the denial of any such petition, subsequent petitions covering the same or substantially the same territory may be filed as aforesaid and new hearings held and determinations made thereon.

C. After the committee has made and recorded a determination that there is need, in the interest of the public health, safety, and welfare, for the organization of a district in a particular territory and has defined the boundaries thereof, it shall consider the question whether the operation of a district within such boundaries with the powers conferred upon soil conservation districts in this act is administratively practicable and feasible. To assist the committee in the determination of such administrative practicability and feasibility, it shall be the duty of the committee, within a reasonable time after entry of the finding that there is need for the organization of the proposed district and the determination of the boundaries thereof, to hold a referendum within the proposed district upon the proposition of the creation of the district, and to cause due notice of such referendum to be given. The question shall be submitted by ballots upon which the words "For creation of a soil conservation district of the lands below described and lying in the county(ies) of ———, ———, and ———" and "Against creation of a soil conservation district of the lands below described and lying in the county(ies) of ——— and ———" shall be printed, with a square before each proposition and a direction to insert an X mark in the square before one or the other of said propositions as the voter may favor or oppose creation of such district. The ballot shall set forth the boundaries of such proposed district as determined by the committee. All occupiers of lands lying within the boundaries of the territory, as determined by the State soil conservation committee, shall be eligible to vote in such referendum. Only such land occupiers shall be eligible to vote.

D. The committee shall pay all expenses for the issuance of such notices and the conduct of such hearings and referenda, and shall supervise the conduct of such hearings and referenda. It shall issue appropriate regulations governing the conduct of such hearings and referenda, and providing for the registration prior to the date of the referendum of all eligible voters, or prescribing some other appropriate procedure for the determination of those eligible as voters in such referendum. No informalities in the conduct of such referendum or in any matters relating thereto shall invalidate said referendum or the result thereof if notice thereof shall have been given substantially as herein provided and said referendum shall have been fairly conducted.

E. The committee shall publish the result of such referendum and shall thereafter consider and determine whether the operation of the district within the defined

boundaries is administratively practicable and feasible. If the committee shall determine that the operation of such district is not administratively practicable and feasible, it shall record such determination and deny the petition. If the committee shall determine that the operation of such district is administratively practicable and feasible, it shall record such determination and shall proceed with the organization of the district in the manner hereinafter provided. In making such determination the committee shall give due regard and weight to the attitudes of the occupiers of lands lying within the defined boundaries, the number of land occupiers eligible to vote in such referendum who shall have voted, the proportion of the votes cast in such referendum in favor of the creation of the district to the total number of votes cast, the approximate wealth and income of the land occupiers of the proposed district, the probable expense of carrying on erosion-control operations within such district, and such other economic and social factors as may be relevant to such determination, having due regard to the legislative determinations set forth in section 2 of this act; provided, however, that the committee shall not have authority to determine that the operation of the proposed district within the defined boundaries is administratively practicable and feasible unless at least a majority of the votes cast in the referendum upon the proposition of creation of the district shall have been cast in favor of the creation of such district.

F. If the committee shall determine that the operation of the proposed district within the defined boundaries is administratively practicable and feasible, it shall appoint two (2) supervisors to act, with the three (3) supervisors elected as provided hereinafter, as the governing body of the district. Such district shall be a governmental subdivision of this State and a public body corporate and politic, upon the taking of the following proceedings:

The two appointed supervisors shall present to the secretary of state an application signed by them, which shall set forth (and such application need contain no detail other than the mere recitals): (1) that a petition for the creation of the district was filed with the State soil conservation committee pursuant to the provisions of this act, and that the proceedings specified in this act were taken pursuant to such petition; that the application is being filed in order to complete the organization of the district as a governmental subdivision and a public body, corporate and politic, under this act; and that the committee has appointed them as supervisors; (2) the name and official residence of each of the supervisors, together with a certified copy of the appointments evidencing their right to office; (3) the term of office of each of the supervisors; (4) the name which is proposed for the district; and (5) the location of the principal office of the supervisors of the district. The application shall be subscribed and sworn to by each of the said supervisors before an officer authorized by the laws of this state to take and certify oaths, who shall certify upon the application that he personally knows the supervisors and knows them to be the officers as affirmed in the application, and that each has subscribed thereto in the officer's presence. The application shall be accompanied by a statement by the State soil conservation committee, which shall certify (and such statement need contain no detail other than the mere recitals) that a petition was filed, notice issued, and hearing held as aforesaid; that the committee did duly determine that there is need, in the interest of the public health, safety, and welfare, for a soil conservation district to function in the proposed territory and did define the boundaries thereof; that notice was given and a referendum held on the question of the creation of such district, and that the result of such referendum showed a majority of the votes cast in such referendum to be in favor of the creation of the district; that thereafter the committee did duly determine that the operation of the proposed district is administratively practicable and feasible. The said statement shall set forth the boundaries of the district as they have been defined by the committee.

The secretary of state shall examine the application and statement and, if he finds that the name proposed for the district is not identical with that of any other soil conservation district of this State or so nearly similar as to lead to confusion or uncertainty, he shall receive and file them and shall record them in an appropriate book of record in his office. If the secretary of state shall find that the name proposed for the district is identical with that of any other soil conservation district of this State, or so nearly similar as to lead to confusion and uncertainty, he shall certify such fact to the State soil conservation committee, which shall thereupon submit to the secretary of state a new name for the said district, which shall not be subject to such defects. Upon receipt of such new name, free of such defects, the secretary of state shall record the application and statement, with the name so modified, in an appropriate book of record in his office. When the application and statement have been made, filed, and recorded, as herein provided, the district shall constitute a governmental subdivision of this State and a public body corporate and politic. The secretary of state shall make and issue to the said supervisors a certificate, under the seal of the State, of the due organization of the said district, and shall record such certificate with the application and statement. The boundaries of such district shall include the territory as determined by the State soil conservation committee as aforesaid, but in no event shall they include any area

included within the boundaries of another soil conservation district organized under the provisions of this act.

G. After six (6) months shall have expired from the date of entry of a determination by the State soil conservation committee that operation of a proposed district is not administratively practicable and feasible, and denial of a petition pursuant to such determination, subsequent petitions may be filed as aforesaid, and action taken thereon in accordance with the provisions of this act.

H. Petitions for including additional territory within an existing district may be filed with the State soil conservation committee, and the proceedings herein provided for in the case of petitions to organize a district shall be observed in the case of petitions for such inclusion. The committee shall prescribe the form for such petitions, which shall be as nearly as may be in the form prescribed in this act for petitions to organize a district. Where the total number of land occupiers in the area proposed for inclusion shall be less than 25, the petition may be filed when signed by a majority of the occupiers of such area, and in such case no referendum need be held. In referenda upon petitions for such inclusion, all occupiers of land lying within the proposed additional area shall be eligible to vote.

I. In any suit, action, or proceeding involving the validity or enforcement of, or relating to, any contract, proceeding, or action of the district, the district shall be deemed to have been established in accordance with the provisions of this act upon proof of the issuance of the aforesaid certificate by the secretary of state. A copy of such certificate duly certified by the secretary of state shall be admissible in evidence in any such suit, action, or proceeding and shall be proof of the filing and contents thereof.

Section 6. Election of Three Supervisors for Each District

Within thirty (30) days after the date of issuance by the secretary of state of a certificate of organization of a soil conservation district, nominating petitions may be filed with the State soil conservation committee to nominate candidates for supervisors of such district. The committee shall have authority to extend the time within which nominating petitions may be filed. No such nominating petition shall be accepted by the committee unless it shall be subscribed by twenty-five (25) or more occupiers of lands lying within the boundaries of such district. Land occupiers may sign more than one such nominating petition to nominate more than one candidate for supervisor. The committee shall give due notice of an election to be held for the election of three supervisors for the district. The names of all nominees on behalf of whom such nominating petitions have been filed within the time herein designated shall be printed, arranged in the alphabetical order of the surnames, upon ballots, with a square before each name and a direction to insert an X mark in the square before any three names to indicate the voter's preference. All occupiers of lands lying within the district shall be eligible to vote in such election. Only such land occupiers shall be eligible to vote. The three candidates who shall receive the largest number, respectively, of the votes cast in such election shall be the elected supervisors for such district. The committee shall pay all the expenses of such election, shall supervise the conduct thereof, shall prescribe regulations governing the conduct of such election and the determination of the eligibility of voters therein, and shall publish the results thereof.

Section 7. Appointment, Qualifications, and Tenure of Supervisors

The governing body of the district shall consist of five (5) supervisors, elected or appointed as provided hereinabove. The two supervisors appointed by the committee shall be persons who are by training and experience qualified to perform the specialized skilled services which will be required of them in the performance of their duties hereunder.

The supervisors shall designate a chairman and may, from time to time, change such designation. The term of office of each supervisor shall be three (3) years, except that the supervisors who are first appointed shall be designated to serve for terms of 1 and 2 years, respectively, from the date of their appointment. A supervisor shall hold office until his successor has been elected or appointed and has qualified. Vacancies shall be filled for the unexpired term. The selection of successors to fill an unexpired term, or for a full term, shall be made in the same manner in which the retiring supervisors shall, respectively, have been selected. A majority of the supervisors shall constitute a quorum and the concurrence of a majority in any matter within their duties shall be required for its determination. A supervisor shall receive no compensation for his services, but he shall be entitled to expenses, including traveling expenses, necessarily incurred in the discharge of his duties.

The supervisors may employ a secretary, technical experts, and such other officers, agents, and employees, permanent and temporary, as they may require, and shall determine their qualifications, duties, and compensation. The supervisors may call upon the attorney general of the State for such legal services as they may require, or may employ their own counsel and legal staff. The supervisors may delegate to their chairman, to one or more supervisors, or to one or more agents, or

employees, such powers and duties as they may deem proper. The supervisors shall furnish to the State soil conservation committee, upon request, copies of such ordinances, rules, regulations, orders, contracts, forms, and other documents as they shall adopt or employ, and such other information concerning their activities as it may require in the performance of its duties under this act.

The supervisors shall provide for the execution of surety bonds for all employees and officers who shall be entrusted with funds or property; shall provide for the keeping of a full and accurate record of all proceedings and of all resolutions, regulations, and orders issued or adopted; and shall provide for an annual audit of the accounts of receipts and disbursements. Any supervisor may be removed by the State soil conservation committee, upon notice and hearing, for neglect of duty or malfeasance in office, but for no other reason.

The supervisors may invite the legislative body of any municipality or county located near the territory comprised within the district to designate a representative to advise and consult with the supervisors of the district on all questions of program and policy which may affect the property, water supply, or other interests of such municipality or county.

SECTION 8. POWERS OF DISTRICTS AND SUPERVISORS

A soil conservation district organized under the provisions of this act shall constitute a governmental subdivision of this State, and a public body corporate and politic, exercising public powers, and such district, and the supervisors thereof, shall have the following powers, in addition to others granted in other sections of this act:

(1) To conduct surveys, investigations, and research relating to the character of soil erosion and the preventive and control measures needed, to publish the results of such surveys, investigations, or research, and to disseminate information concerning such preventive and control measures; provided, however, that in order to avoid duplication of research activities, no district shall initiate any research program except in cooperation with the government of this State or any of its agencies, or with the United States or any of its agencies;

(2) To conduct demonstrational projects within the district on lands owned or controlled by this State or any of its agencies, with the cooperation of the agency administering and having jurisdiction thereof, and on any other lands within the district upon obtaining the consent of the occupier of such lands or the necessary rights or interests in such lands, in order to demonstrate by example the means, methods, and measures by which soil and soil resources may be conserved, and soil erosion in the form of soil blowing and soil washing may be prevented and controlled;

(3) To carry out preventive and control measures within the district including, but not limited to, engineering operations, methods of cultivation, the growing of vegetation, changes in use of land, and the measures listed in subsection C of section 2 of this act, on lands owned or controlled by this State or any of its agencies, with the cooperation of the agency administering and having jurisdiction thereof, and on any other lands within the district upon obtaining the consent of the occupier of such lands or the necessary rights or interests in such lands;

(4) To cooperate, or enter into agreements with, and within the limits of appropriations duly made available to it by law, to furnish financial or other aid to any agency, governmental or otherwise, or any occupier of lands within the district, in the carrying on of erosion-control and prevention operations within the district, subject to such conditions as the supervisors may deem necessary to advance the purposes of this act;

(5) To obtain options upon and to acquire, by purchase, exchange, lease, gift, grant, bequest, devise, or otherwise, any property, real or personal, or rights or interests therein; to maintain, administer, and improve any properties acquired, to receive income from such properties and to expend such income in carrying out the purposes and provisions of this act; and to sell, lease, or otherwise dispose of any of its property or interests therein in furtherance of the purposes and the provisions of this act;

(6) To make available, on such terms as it shall prescribe, to land occupiers within the district, agricultural and engineering machinery and equipment, fertilizer, seeds, and seedlings, and such other material or equipment as will assist such land occupiers to carry on operations upon their lands for the conservation of soil resources and for the prevention and control of soil erosion;

(7) To construct, improve, and maintain such structures as may be necessary or convenient for the performance of any of the operations authorized in this act;

(8) To develop comprehensive plans for the conservation of soil resources and for the control and prevention of soil erosion within the district, which plans shall specify in such detail as may be possible, the acts, procedures, performances, and avoidances which are necessary or desirable for the effectuation of such plans, including the specification of engineering operations, methods of cultivation, the growing of vegetation, cropping programs, tillage practices, and changes in use of land; and to publish such plans and information and bring them to the attention of occupiers of lands within the district;

(9) To take over, by purchase, lease, or otherwise, and to administer, any soil-conservation, erosion-control, or

erosion-prevention project located within its boundaries undertaken by the United States or any of its agencies, or by this State or any of its agencies; to manage, as agent of the United States or any of its agencies, or of this State or any of its agencies, any soil-conservation, erosion-control, or erosion-prevention project within its boundaries; to act as agent for the United States, or any of its agencies, or for this State or any of its agencies, in connection with the acquisition, construction, operation, or administration of any soil-conservation, erosion-control, or erosion-prevention project within its boundaries; to accept donations, gifts, and contributions in money, services, materials, or otherwise, from the United States of any of its agencies, or from this State or any of its agencies, and to use or expend such moneys, services, materials, or other contributions in carrying on its operations;

(10) To sue and be sued in the name of the district; to have a seal, which seal shall be judicially noticed; to have perpetual succession unless terminated as hereinafter provided; to make and execute contracts and other instruments, necessary or convenient to the exercise of its powers; to make, and from time to time amend and repeal, rules and regulations not inconsistent with this act, to carry into effect its purposes and powers;

(11) As a condition to the extending of any benefits under this act to, or the performance of work upon, any lands not owned or controlled by this State or any of its agencies, the supervisors may require contributions in money, services, materials, or otherwise to any operations conferring such benefits, and may require land occupiers to enter into and perform such agreements or convenants as to the permanent use of such lands as will tend to prevent or control erosion thereon;

(12) No provisions with respect to the acquisition, operation, or disposition of property by other public bodies shall be applicable to a district organized hereunder unless the legislature shall specifically so state.

Section 9. Adoption of Land-Use Regulations

The supervisors of any district shall have authority to formulate regulations governing the use of lands within the district in the interest of conserving soil and soil resources and preventing and controlling soil erosion. The supervisors may conduct such public meetings and public hearings upon tentative regulations as may be necessary to assist them in this work. The supervisors shall not have authority to enact such land-use regulations into law until after they shall have caused due notice to be given of their intention to conduct a referendum for submission of such regulations to the occupiers of lands lying within the boundaries of the district for their indication of approval or disapproval of such proposed regulations, and until after the supervisors have considered the result of such referendum. The proposed regulations shall be embodied in a proposed ordinance. Copies of such proposed ordinance shall be available for the inspection of all eligible voters during the period between publication of such notice and the date of the referendum. The notices of the referendum shall recite the contents of such proposed ordinance, or shall state where copies of such proposed ordinance may be examined. The question shall be submitted by ballots, upon which the words "For approval of proposed ordinance no. ———, prescribing land-use regulations for conservation of soil and prevention of erosion" and "Against approval of proposed ordinance no. ———, prescribing land-use regulations for conservation of soil and prevention of erosion" shall be printed, with a square before each proposition and a direction to insert an X mark in the square before one or the other of said propositions as the voter may favor or oppose approval of such proposed ordinance. The supervisors shall supervise such referendum, shall prescribe appropriate regulations governing the conduct thereof, and shall publish the result thereof. All occupiers of lands within the district shall be eligible to vote in such referendum. Only such land occupiers shall be eligible to vote. No informalities in the conduct of such referendum or in any matters relating thereto shall invalidate said referendum or the result thereof if notice thereof shall have been given substantially as herein provided and said referendum shall have been fairly conducted.

The supervisors shall not have authority to enact such proposed ordinance into law unless at least a majority of the votes cast in such referendum shall have been cast for approval of the said proposed ordinance. The approval of the proposed ordinance by a majority of the votes cast in such referendum shall not be deemed to require the supervisors to enact such proposed ordinance into law. Land-use regulations prescribed in ordinances adopted pursuant to the provisions of this section by the supervisors of any district shall have the force and effect of law in the said district and shall be binding and obligatory upon all occupiers of lands within such district.

Any occupier of land within such district may at any time file a petition with the supervisors asking that any or all of the land-use regulations prescribed in any ordinance adopted by the supervisors under the provisions of this section shall be amended, supplemented, or repealed. Land-use regulations prescribed in any ordinance adopted pursuant to the provisions of this section shall not be amended, supplemented, or repealed except in accordance with the procedure prescribed in this section for adoption of land-use regulations. Referenda on adoption, amendment, supplementation, or repeal of

land-use regulations shall not be held more often than once in six (6) months.

The regulations to be adopted by the supervisors under the provisions of this section may include:

1. Provisions requiring the carrying out of necessary engineering operations, including the construction of terraces, terrace outlets, check dams, dikes, ponds, ditches, and other necessary structures;

2. Provisions requiring observance of particular methods of cultivation including contour cultivating, contour furrowing, lister furrowing, sowing, planting, strip cropping, seeding, and planting of lands to water-conserving and erosion-preventing plants, trees and grasses, forestation, and reforestation;

3. Specifications of cropping programs and tillage practices to be observed;

4. Provisions requiring the retirement from cultivation of highly erosive areas or of areas on which erosion may not be adequately controlled if cultivation is carried on;

5. Provisions for such other means, measures, operations, and programs as may assist conservation of soil resources and prevent or control soil erosion in the district, having due regard to the legislative findings set forth in section 2 of this act.

The regulations shall be uniform throughout the territory comprised within the district except that the supervisors may classify the lands within the district with reference to such factors as soil type, degree of slope, degree of erosion threatened or existing, cropping and tillage practices in use, and other relevant factors, and may provide regulations varying with the type or class of land affected, but uniform as to all lands within each class or type. Copies of land-use regulations adopted under the provisions of this section shall be printed and made available to all occupiers of lands lying within the district.

Section 10. Enforcement of Land-use Regulations

The supervisors shall have authority to go upon any lands within the district to determine whether land-use regulations adopted under the provisions of section 9 of this act are being observed. Any person, firm, or corporation who shall violate any of such regulations shall be guilty of a misdemeanor, and, upon conviction, shall be punished by a fine of not less than ——— dollars, and not more than ——— dollars for each such offense, at the discretion of the court. The supervisors are further authorized to provided by ordinance that any land occupier who shall sustain damages from any violation of such regulations by any other land occupier may recover damages at law from such other land occupier for such violation.

Section 11. Performance of Work Under the Regulations by the Supervisors

Where the supervisors of any district shall find that any of the provisions of land-use regulations prescribed in an ordinance adopted in accordance with the provisions of section 9 hereof are not being observed on particular lands, and that such nonobservance tends to increase erosion on such lands and is interfering with the prevention or control of erosion on other lands within the district, the supervisors may present to ——— [8] a petition, duly verified, setting forth the adoption of the ordinance prescribing land-use regulations, the failure of the defendant land occupier to observe such regulations, and to perform particular work, operations, or avoidances as required thereby, and that such nonobservance tends to increase erosion on such lands and is interfering with the prevention or control of erosion on other lands within the district, and praying the court to require the defendant to perform the work, operations, or avoidances within a reasonable time and to order that if the defendant shall fail so to perform the supervisors may go on the land, perform the work or other operations or otherwise bring the condition of such lands into conformity with the requirements of such regulations, and recover the costs and expenses thereof, with interest, from the occupier of such land. Upon the presentation of such petition, the court shall cause process to be issued against the defendant, and shall hear the case. If it shall appear to the court that testimony is necessary for the proper disposition of the matter, it may take evidence, or appoint a referee to take such evidence as it may direct and report the same to the court with his findings of fact and conclusions of law, which shall constitute a part of the proceedings upon which the determination of the court shall be made. The court may dismiss the petition; or it may require the defendant to perform the work, operations, or avoidances, and may provide that upon the failure of the defendant to initiate such performance within the time specified in the order of the court, and to prosecute the same to completion with reasonable diligence, the supervisors may enter upon the lands involved and perform the work or operations or otherwise bring the condition of such lands into conformity with the requirements of the regulations and recover the costs and expenses thereof, with interest at the rate of 5 per centum per annum, from the occupier of such lands. In all cases where the person in possession of lands, who shall fail to perform such work, operations, or avoidances shall not be the owner, the owner of such lands shall be joined as party defendant.

The court shall retain jurisdiction of the case until

[8] There should be here inserted the title of the appropriate court of original law and equity jurisdiction in the State.

after the work has been completed. Upon completion of such work pursuant to such order of the court the supervisors may file a petition with the court, a copy of which shall be served upon the defendant in the case, stating the costs and expenses sustained by them in the performance of the work and praying judgment therefor with interest. The court shall have jurisdiction to enter judgment for the amount of such costs and expenses, with interest at the rate of 5 per centum per annum until paid, together with the costs of suit, including a reasonable attorney's fee to be fixed by the court. The Supervisors shall have further authority to certify to ——— [9] the amount of such judgment, which shall be a lien upon such lands, and shall be collected as are general taxes upon real estate. The procedure for collection of delinquent general taxes upon real estate shall be applicable to the collection of such judgments. When such judgment shall be paid or collected, the proceeds shall be paid over to the district within the boundaries of which the lands shall lie.

SECTION 12. BOARD OF ADJUSTMENT

A. Where the supervisors of any district organized under the provisions of this act shall adopt an ordinance prescribing land-use regulations in accordance with the provisions of section 9 hereof, they shall further provide by ordinance for the establishment of a board of adjustment. Such board of adjustment shall consist of three (3) members, each to be appointed for a term of three (3) years, except that the members first appointed shall be appointed for terms of 1, 2, and 3 years, respectively. The members of each such board of adjustment shall be appointed by the State soil conservation committee, with the advice and approval of the supervisors of the district for which such board has been established, and shall be removable, upon notice and hearing, for neglect of duty or malfeasance in office, but for no other reason, such hearing to be conducted jointly by the State soil conservation committee and the supervisors of the district. Vacancies in the board of adjustment shall be filled in the same manner as original appointments, and shall be for the unexpired term of the member whose term becomes vacant. Members of the State soil conservation committee and the supervisors of the district shall be ineligible to appointment as members of the board of adjustment during their tenure of such other office. The members of the board of adjustment shall receive compensation for their services at the rate of ——— dollars ($ ———) per diem for time spent on the work of the board, in addition to expenses, including traveling expenses, necessarily incurred in the discharge of their duties. The supervisors shall pay the necessary administrative and other expenses of operation incurred by the board, upon the certificate of the chairman of the board.

B. The board of adjustment shall adop. rules to govern its procedures, which rules shall be in accordance with the provisions of this act and with the provisions of any ordinance adopted pursuant to this section. The board shall designate a chairman from among its members, and may, from time to time, change such designation. Meetings of the board shall be held at the call of the chairman and at such other times as the board may determine. Any two (2) members of the board shall constitute a quorum. The chairman, or in his absence such other member of the board as he may designate to serve as acting chairman, may administer oaths and compel the attendance of witnesses. All meetings of the board shall be open to the public. The board shall keep a full and accurate record of all proceedings, of all documents filed with it, and of all orders entered, which shall be filed in the office of the board and shall be a public record.

C. Any land occupier may file a petition with the board of adjustment alleging that there are great practical difficulties or unnecessary hardship in the way of his carrying out upon his lands the strict letter of the land-use regulations prescribed by ordinance approved by the supervisors, and praying the board to authorize a variance from the terms of the land-use regulations in the application of such regulations to the lands occupied by the petitioner. Copies of such petition shall be served by the petitioner upon the chairman of the supervisors of the district within which his lands are located and upon the chairman of the State soil conservation committee. The board of adjustment shall fix a time for the hearing of the petition and cause due notice of such hearing to be given. The supervisors of the district and the State soil conservation committee shall have the right to appear and be heard at such hearing. Any occupier of lands lying within the district who shall object to the authorizing of the variance prayed for may intervene and become a party to the proceedings. Any party to the hearing before the board may appear in person, by agent, or by attorney. If, upon the facts presented at such hearing, the board shall determine that there are great practical difficulties or unnecessary hardship in the way of applying the strict letter of any of the land-use regulations upon the lands of the petitioner, it shall make and record such determination and shall make and record findings of fact as to the specific conditions which establish such great practical difficulties or unnecessary hardship. Upon the basis of such findings and determination, the board shall have power by order to authorize such variance from the terms of the land-use regulations, in their application

[9] There should be here inserted the name of the official, State or county or otherwise, who may be charged by law with collecting taxes upon real property.

to the lands of the petitioner, as will relieve such great practical difficulties or unnecessary hardship and will not be contrary to the public interest, and such that the spirit of the land-use regulations shall be observed, the public health, safety, and welfare secured, and substantial justice done.

D. Any petitioner aggrieved by an order of the board granting or denying, in whole or in part, the relief sought, the supervisors of the district, or any intervening party, may obtain a review of such order in any ——— [10] court, by filing in such court a petition praying that the order of the board be modified or set aside. A copy of such petition shall forthwith be served upon the parties to the hearing before the board and thereupon the party seeking review shall file in the court a transcript of the entire record in the proceedings, certified by the board, including the documents and testimony upon which the order complained of was entered, and the findings, determination, and order of the board. Upon such filing, the court shall cause notice thereof to be served upon the parties and shall have jurisdiction of the proceedings and of the questions determined or to be determined therein, and shall have power to grant such temporary relief as it deems just and proper, and to make and enter a decree enforcing, modifying, and enforcing as so modified, or setting aside, in whole or in part, the order of the board. No contention that has not been urged before the board shall be considered by the court unless the failure or neglect to urge such contention shall be excused because of extraordinary circumstances. The findings of the board as to the facts, if supported by evidence, shall be conclusive. If any party shall apply to the court for leave to produce additional evidence and shall show to the satisfaction of the court that such evidence is material and that there were reasonable grounds for the failure to produce such evidence in the hearing before the board, the court may order such additional evidence to be taken before the board and to be made a part of the transcript. The board may modify its findings as to the facts or make new findings, taking into consideration the additional evidence so taken and filed, and it shall file such modified or new finding which, if supported by evidence, shall be conclusive, and shall file with the court its recommendations, if any, for the modification or setting aside of its original order. The jurisdiction of the court shall be exclusive and its judgment and decree shall be final, except that the same shall be subject to review in the same manner as are other judgments or decrees of the court.[11]

[10] There should be here inserted the name of the appropriate court exercising original or appellate law and equity jurisdiction.

[11] This last provision may need to be adjusted to the law of the particular State.

SECTION 13. COOPERATION BETWEEN DISTRICTS

The supervisors of any two or more districts organized under the provisions of this act may cooperate with one another in the exercise of any or all powers conferred in this act.

SECTION 14. STATE AGENCIES TO COOPERATE

Agencies of this State which shall have jurisdiction over, or be charged with the administration of, any State-owned lands, and of any county, or other governmental subdivision of the State, which shall have jurisdiction over or be charged with the administration of, any county-owned or other publicly owned lands, lying within the boundaries of any district organized hereunder, shall cooperate to the fullest extent with the supervisors of such districts in the effectuation of programs and operations undertaken by the supervisors under the provisions of this act. The supervisors of such districts shall be given free access to enter and perform work upon such publicly owned lands. The provisions of land-use regulations adopted pursuant to section 9 of this act shall have the force and effect of law over all such publicly owned lands, and shall be in all respects observed by the agencies administering such lands.

SECTION 15. DISCONTINUANCE OF DISTRICTS

At any time after five (5) years after the organization of a district under the provisions of this act, any twenty-five (25) occupiers of land lying within the boundaries of such district may file a petition with the State soil conservation committee praying that the operations of the district be terminated and the existence of the district discontinued. The committee may conduct such public meetings and public hearings upon such petition as may be necessary to assist it in the consideration thereof. Within sixty (60) days after such a petition has been received by the committee it shall give due notice of the holding of a refer endum, and shall supervise such referendum, and issue appropriate regulations governing the conduct thereof, the question to be submitted by ballots upon which the words "*For terminating the existence of the* ——— (name of the soil conservation district to be here inserted)" and "Against terminating the existence of the ——— (name of the soil conservation district to be here inserted)" shall be printed, with a square before each propostiton and a direction to insert an X mark in the square before one or the other of said propositions as the voter may favor or oppose discontinuance of such district. All occupiers of lands lying within the boundaries of the district shall be eligible to vote in such referendum. Only such land occupiers shall be eligible to vote. No informalities in the conduct of such referendum or in any matters relating thereto shall invalidate said referendum or

the result thereof if notice thereof shall have been given substantially as herein provided and said referendum shall have been fairly conducted.

The committee shall publish the result of such referendum and shall thereafter consider and determine whether the continued operation of the district within the defined boundaries is administratively practicable and feasible. If the committee shall determine that the continued operation of such district is administratively practicable and feasible, it shall record such determination and deny the petition. If the committee shall determine that the continued operation of such district is not administratively practicable and feasible, it shall record such determination and shall certify such determination to the supervisors of the district. In making such determination the committee shall give due regard and weight to the attitudes of the occupiers of lands lying within the district, the number of land occupiers eligible to vote in such referendum who shall have voted, the proportion of the votes cast in such referendum in favor of the discontinuance of the district to the total number of votes cast, the approximate wealth and income of the land occupiers of the district, the probable expense of carrying on erosion control operations within such district, and such other economic and social factors as may be relevant to such determination, having due regard to the legislative findings set forth in section 2 of this act; provided, however, that the committee shall not have authority to determine that the continued operation of the district is administratively practicable and feasible unless at least a majority of the votes cast in the referendum shall have been cast in favor of the continuance of such district.

Upon receipt from the State soil conservation committee of a certification that the committee has determined that the continued operation of the district is not administratively practicable and feasible, pursuant to the provisions of this section, the supervisors shall forthwith proceed to terminate the affairs of the district. The supervisors shall dispose of all property belonging to the district at public auction and shall pay over the proceeds of such sale to be covered into the State treasury. The supervisors shall thereupon file an application, duly verified, with the secretary of state for the discontinuance of such district, and shall transmit with such application the certificate of the State soil conservation committee setting forth the determination of the committee that the continued operation of such district is not administratively practicable and feasible. The application shall recite that the property of the district has been disposed of and the proceeds paid over as in this section provided, and shall set forth a full accounting of such properties and proceeds of the sale. The secretary of state shall issue to the supervisors a certificate of dissolution and shall record such certificate in an appropriate book of record in his office.

Upon issuance of a certificate of dissolution under the provisions of this section, all ordinances and regulations theretofore adopted and in force within such districts shall be of no further force and effect. All contracts theretofore entered into, to which the district or supervisors are parties, shall remain in force and effect for the period provided in such contracts. The State soil conservation committee shall be substituted for the district or supervisors as party to such contracts. The committee shall be entitled to all benefits and subject to all liabilities under such contracts and shall have the same right and liability to perform, to require performance, to sue and be sued thereon, and to modify or terminate such contracts by mutual consent or otherwise, as the supervisors of the district would have had. Such dissolution shall not affect the lien of any judgment entered under the provisions of section 11 of this act, nor the pendency of any action instituted under the provisions of such section, and the committee shall succeed to all the rights and obligations of the district or supervisors as to such liens and actions.

The State soil conservation committee shall not entertain petitions for the discontinuance of any district nor conduct referenda upon such petitions nor make determinations pursuant to such petitions in accordance with the provisions of this act, more often than once in five (5) years.

SECTION 16. APPROPRIATIONS [11]

[*Provision should be here made for an appropriation* out of funds in the State treasury to finance the operations of the State soil conservation committee, and to finance the activities of soil conservation districts organ-

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[11] The standard act contemplates that funds to finance the operations of the districts (which will, of course, be supplemented with contributions by land occupiers of funds, labor, materials, and equipment, for erosion-control operations carried out on their lands) will be secured in two ways: (a) By appropriations made available to the districts out of funds in the State treasury, these funds to be annually appropriated by the State legislature and to be divided among the various districts; (b) funds properties, and services made available to the districts by the United States through the Soil Conservation Service of the Department of Agriculture or through any other agencies.

Two other possible sources of funds may be considered, but it is very strongly felt that it will be unwise to utilize them. These two possible sources are: (a) A grant of power to the districts to levy property taxes upon property within the district, or to make assessments against property in the district for benefits conferred; (b) a grant of power to the districts to borrow money by selling bonds.

It must be borne in mind that these conservation districts will not be operating revenue-producing properties. In this very important respect the soil conservation districts will differ from public bodies operating toll bridges, power plants, low-cost housing projects, and other revenue-producing properties. There are now too many local governmental authorities with power to levy real property taxes. The farm and grazing lands of this country are now too heavily subject to property taxation. Insofar as the soil conservation districts are financed by appropriations out of the Federal and State treasuries, a substantial part of such funds will be derived from income and inheritance taxation. It is much to be preferred that revenues to finance the operations of these districts shall come from sources other than property taxation.

If the soil conservation districts are given authority to levy property taxes upon farms in the district, it may be expected that a great many of such farms will be found already tax delinquent and unable to pay the taxes assessed. This source of funds is therefore perhaps quite unreliable. It seems unnecessary, also, to assess against particular landowners the entire costs of terracing, the building of check dams and

ized under this law. For the latter purpose, it should be provided *that the State soil conservation committee shall* annually certify to the State treasurer or other appropriate official, the number of districts in operation in the State. Provision may be made on an acreage or other basis for an allocation of the annual appropriation among the districts. No form of provision is here set out inasmuch as this must necessarily differ in every State. In some States it may be necessary that the appropriations be embodied in a separate act.]

SECTION 17. SEPARABILITY CLAUSE

If any provision of this act, or the application of any provision to any person or circumstance, is held invalid, the remainder of the act, and the application of such provision to other persons or circumstances, shall not be affected thereby.

SECTION 18. INCONSISTENCY WITH OTHER ACTS

Insofar as any of the provisions of this act are inconsistent with the provisions of any other law, the provisions of this act shall be controlling.

SECTION 19. EFFECTIVE DATE [13]

ponds, and other engineering operations, when all the people in the State will profit from such operations.

If the districts are authorized to issue bonds, such bonds will ultimately have to be retired from property taxation or assessments against the properties in the districts, inasmuch as the districts do not operate revenue-producing properties. The issuance of bonds by these districts would therefore simply create a postponed liability without adequate appropriate provision for later retirement of the bonds.

It may be noted, also, that attempts to assess benefits against the farms in the districts and to offset against such benefits losses sustained by the farmer in not seeding sloping surfaces or in converting part of the crop land into wood lots, etc., will raise a number of administrative difficulties and will be sources of constant friction in the operation of the districts.

For all of these reasons it seems clearly preferable to finance the operations of the soil conservation districts by direct appropriation out of the State treasury and by supplementation with Federal aid.

[13] Provision should be here made, in accordance with the requirements of the constitution of the particular State, declaring an emergency, and providing that the act shall go into effect upon passage, or at the earliest date permitted under the State constitution.

Appendix 8

SUMMARY OF TEXAS LEGISLATION ON SOIL EROSION CONTROL

There are two Texas statutes to provide programs or the control of soil erosion. The first was Senate Bill No. 227, approved May 11, 1935 (1935 Texas Law, Ch. 214, p. 504; Vernon's Texas St. [1936] Art. 165a–1). This statute authorized commissioner's courts (county legislative and administrative bodies) of the several counties, upon the application of individual landowners, to enter into written contracts with such landowners providing for the construction on the lands to be covered by the contract of "improvements . . . in the nature of farm terraces, dikes, ditches, soil and water reservoirs, and other soil and water conservation and erosion prevention devices." The entire cost of the making of the improvements is required to be assessed to the landowner with the stipulation that such assessment shall not "exceed the actual cost of labor, material, and fuel, and no charge shall be made for depreciation and/or other expenses." The amount of the assessment is to remain a lien against the lands upon which the work has been done. The contract entered into with the landowner may provide for repayment by him of the cost of the work over a period of not more than 10 years, but the amount of such "assessments" are to bear no interest until after maturity. To make funds available for the performance of this work in the period prior to the collection of assessments, the statute provides that the commissioners' court of each county may appropriate any amount up to 25 percent of the net collections made in the county of the motor vehicle license fees, but such appropriation may in no county exceed $12,500. It is also provided that not more than $300 shall be spent in any one year on any one farm.

The statute directs the board of directors of the Texas Agricultural and Mechanical College to formulate plans for the prevention of soil erosion and presumably, although this is not specified in the statute, to bring such plans to the attention of the county commissioners' courts. The statute does not require the commissioners' courts to observe the plans formulated by the College.

The College is further authorized to accept "gifts, grants, donations, advances, and services" from any agency of the United States and to allocate such funds and services among the commissioners' courts of the several counties of the State.

It will be noted that under this statute no erosion control operations could be carried on on any lands unless the owner wanted to have the work done and that in any event the total cost of the operations to be performed was to be assumed by the individual landowner although in effect the landowner could borrow the sum necessary to defray the expenses, the loan to be repaid over a period of 10 years without interest. It seems that very little work was actually done under this legislation. A large number of the landowners felt unable to assume these additional costs. The statute may be said to be a step in the right direction, but only a short step.

Not long after the adoption of the statute above summarized, another law on this subject was passed. This was House Bill No. 978, approved May 21, 1935 (1935 Texas Laws, Ch. 337, p. 771; Vernon's Texas St. [1936] Art. 165a–2). This statute duplicates the former one to a large extent but does not repeal the earlier act. While the first statute purported to deal with both water erosion and wind erosion, the second is concerned only with wind erosion.

The 1935 statute provides that when petitioned by not less than 50 duly qualified property tax paying voters, the commissioners' court of any county shall call a county election to determine whether a majority of the legally qualified property tax paying voters of the county favor the incorporation of the area of the county into a "wind erosion conservation district." If the result of the election is favorable, the county judge is directed to issue an order declaring the district to be incorporated. The county commissioners and the county judge thereupon become the governing body of the district. The districts are authorized "to construct improvements and maintain any and all facilities to arrest or prevent the erosion of soils on lands within such district by reason of winds" and "to have the right to enter upon any lands in the district for the purpose of treating same to prevent the spread of soil erosion and damage to other lands in such district."

The statute provides that when a program of work has been determined upon an assessment may be made against the lands which will be improved by the erosion control operations for the cost of the work after appropriate notice and hearing. No assessment may be made against any property in excess "of the actual benefit to such owner in the protection given his property."

Alternative methods of financing are provided. The districts are authorized to borrow money and to accept grants from agencies of the United States. It is further provided that the commissioners' court of any county which has been organized as a district may authorize the expenditure of not to exceed 20 percent of the automobile registration fees accruing to such county as well as "all or any part of any road and bridge special taxes that may be authorized by vote of the people of any such county." Finally, the statute diverts to the conservation districts that may be formed in the counties of Dallam, Hartley, Oldham, Deaf Smith, Sherman, and Moore, all of the State ad valorem taxes that will accrue and be payable to the State of Texas for the years 1935 and 1936 from property located in those counties, and diverts 50 percent of the ad valorem taxes that will so accrue for these years from property located in Lipscomb, Hansford, and Ochiltree counties to the conservation districts that may be formed in those three counties.

It will be seen that the second statute differs from the first in that it makes additional tax funds available for erosion control purposes, although only to a small list of counties, and in that it is limited to programs for the control of erosion because of winds. The most important difference between the two statutes, however, lies in the fact that the second statute seems to empower the districts to enter upon private lands without the consent of the owner in order to perform erosion control operations thereon where such lands are endangering other lands in the district.

The following difficulties with the second statute above summarized should be noted:

1. The procedure provided for getting the work performed upon the lands of unwilling owners is of doubtful constitutionality in that no provision is made for giving notice and an opportunity for hearing to the landowner either before entry may be made upon his lands for performance of the work or before the amount of the assessment to be made against him is determined.

2. The two statutes largely duplicate each other. Indeed, any county in the State may choose to operate under both of the statutes, the governing board acting in one case in their capacity of commissioners' court of the county, and in the other case in their capacity of the governing board of the district. If any county did choose to act under both statutes, some confusion might result from the fact that as much as 25 percent of the motor vehicle license fees are authorized to be diverted to finance the erosion control operations under the first statute, whereas only 20 percent may be diverted under the second statute. It is likely, however, that in practice those counties which suffer particularly from wind erosion will organize under the second statute, while counties suffering particularly from water erosion will institute operations under the first.

3. Both statutes seem to contemplate primarily the construction of engineering improvements such as terraces, ditches, dams, and the like, and are not adequately implemented to bring about comprehensive changes in land use, such as strip cropping, contour furrowing, crop rotation, retirement from cultivation of steep, highly erosive areas and tracts of land which are badly gullied, soil stabilization with thick-growing soil-holding grasses, and the like.

4. The statute does not provide methods for enlisting the voluntary cooperation of the farmers.

It should be emphasized that the legislation adopted in Texas, despite the shortcomings indicated above, represents, nevertheless, the furthest advance which any State has made so far in the direction of establishing significant State programs for the control of soil erosion. The State has been a pioneer and it need not be wondered that the initial efforts indicate room for improvement. Valuable operations are now being carried on in at least a score of Texas counties for the control of erosion. The United States Soil Conservation Service this year entered into a memorandum of understanding with nine Texas counties organized as wind erosion conservation districts, under the second of the two statutes discussed above. This memorandum of understanding provides for a cooperative program of operations to be carried on in the nine counties of Dallam, Sherman, Moore, Deaf Smith, Oldham, Hartley, Hansford, Lipscomb, and Ochiltree, with the assistance of the Soil Conservation Service, which will make contributions in labor, equipment, and materials to the work of the districts.

It should also be noted that a number of independent water control, flood control, and conservation districts have been organized in Texas by special statute for the control of water and drainage problems within particular river-sheds, and that some of these water and flood control districts have been given limited powers to carry on erosion control operations within the district boundaries insofar as erosion interfered with the water control problems of such special districts.

Appendix 9

SUMMARY OF THE NEW YORK PLAN FOR DEVELOPING AND PRESERVING STATE FOREST LAND

The New York law authorizes the State Conservation Department, and any county, city, town, village, school district, or other political subdivision of the State, to acquire by gift or purchase, land which is suitable for reforestation, recreation, and kindred purposes.[1]

The Conservation Department is authorized to acquire by gift or purchase, reforestation areas not less than five hundred acres of adjoining lands, to be devoted to planting, growing, and harvesting trees best suited for lands to be reforested.

The purpose of this authority is to acquire lands suitable for reforestation, to establish and maintain thereon forests for watershed protection, to produce timber and other forest products, and provide for recreation and related purposes. The sale of timber and other forest products from such lands is authorized, but the use to be made of the proceeds is not specified. Land thus acquired is exempt forever from State and county taxes. However, the State agrees to pay local land-assessment taxes.

The act provides for an annual appropriation of $1,000,000 for the first year with increases thereafter.

The authority of the various political subdivisions of the State to acquire unused land for foresting purposes is also provided for.[2] The purchase price may be provided for by appropriation, or by the issuance of bonds by the governing body of the subdivision. The State Conservation Department is authorized to assist in the actual reforestation work. The governing body has full power to manage the land but the net income must be paid into the general fund.

The New York law likewise authorizes counties to acquire land under practically the same conditions as the Conservation Department.[3]

It also provides for State grants to counties of not more than $5,000 a year to any one county. Title is to be taken in the county's name. Timber and forest products may be sold, and the land exempted from State and county taxes. However, the land is subject to local taxes. Purchases must be approved by the Conservation Commissioner, who has general supervision over the land.

By way of supplementing this land purchase program, New York has attempted to stimulate conservation of forest land in private ownership through its tax system. The law provides that the owner of forest land may have it assessed upon the basis of the value of the land, exclusive of the value of any timber growing on the land, and that it shall not be assessed at a higher valuation than similar land without substantial forest growth.[4] The land continues to be assessed at this special valuation so long as the forest growth remains uncut.

If timber is cut from the land, the owner must pay a tax equal to 6 percent of its stumpage value. After the land contains a certain quantity of merchantable timber, the Conservation Department may notify the owner that the tax of 6 percent of the stumpage value will be due two years from the date of the notice, regardless of whether the timber has been cut. However, if the owner cuts the timber "as directed by the Conservation Department according to the principles of practicable forest management" the tax on the uncut timber will not become due until it is cut, and the land will continue to be classified as forest land.

The law defines forest land, the procedure to have land so classified, as well as the procedure for withdrawing land from that classification.

Subject to prescribed conditions, the State may acquire from the United States by gift, lease, purchase, or otherwise, any land suited for reforestation, game management, fish propagation, park purposes, or any other activities permitted by the State conservation law.[5]

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[1] See McKinney's Consolidated Laws of New York, section 60-a, Book 10, for the authority of the Conservation Department.

[2] See McKinney's Consolidated Laws of New York, section 60, Book 10.

[3] McKinney's Consolidated Laws of New York, section 12 (28-2-6), Book 11.

[4] McKinney's Consolidated Laws of New York, section 13, Book 59.

[5] McKinney's Consolidated Laws of New York, section 4, Book 10.

Appendix 10

SUMMARY OF THE WISCONSIN PLAN FOR DEVELOPING AND PRESERVING STATE FOREST LAND

The Wisconsin Act provides for an annual tax levy for acquiring, preserving, and developing State forests.[1] The tax proceeds, with other funds, may be used for acquiring any land suitable for State forests, including land owned by counties through tax deeds. Such land may be developed.[2]

Income derived from State forest land, including timber sale proceeds, and land sales, is paid into a reforestation fund which is also available for land purchases.[3]

Conditions are specified under which State-owned forest land may be sold. The State may acquire by long-term lease, treaty, or cooperative agreement, land *previously acquired by the United States, and establish* thereon State forests, parks, or other conservation areas. Both State and county may exchange or purchase land in order to block out State-owned or county-owned forest lands.[4]

The forest crop taxation law[5] encourages forestation and reforestation activities on privately owned land in order to preserve the remaining forest growth in the State, and to encourage forest product growths on land not more useful for other purposes. This is done so the land will continue to furnish recurring forest products for commercial use in a manner which will not hamper the towns from receiving their just tax revenue from the land. Briefly this plan is as follows:

If the landowner petitions, asking for the benefits of the forest crop tax law, and if the conservation commission grants *his petition, the ordinary real property tax is not* levied. An annual "acreage share" computed at the rate of 10 cents per acre will be substituted unless the land is specially classified. If thereafter forest crop timber is cut from the land, the owner must also pay a severance tax. This constitutes 10 percent of the value of the timber cut, unless the land is specially classified. This arrangement is declared to be a contract between the landowner and the State. If, after fifty years, a new contract is not entered into by mutual consent, a severance tax must be paid regardless of whether the timber has been cut.

Under Wisconsin law, land must be specially classified, if less than 50 percent of the original volume of merchantable timber on the land has been removed since 1915. The owner of land specially classified must pay an "acreage share" of 40 cents per acre for the first year. This rate decreases 5 cents per acre for the next 8 years until it reaches the standard rate of 10 cents. However, *the owner of such land is not required* to pay a severance tax of 2 percent of the value of the timber cut for the first year. This severance tax increases 1 percent for the next 8 years until it reaches the standard rate of 10 percent.

If, at any time, 50 percent or more of the merchantable timber has been removed, the special classification is discontinued. Therefore, a special classification is applicable during a 9-year transition period, while a substantial forest stand is growing on the land.

Under Wisconsin law the State pays to the town in which the forest crop land is located, 10 cents per acre for each acre on which the owner has paid his "acreage share." If the forest crop land is owned by a county, the State makes this contribution without a payment of the "acreage share" by the county. An amount equal *to the State contribution is paid to the State from the* severance tax when it is collected. Under certain conditions Wisconsin law provides that forest crop land may be returned to the general tax rolls, with or without the consent of the owner.

[1] Wisconsin Statutes 70.58. [2] Wisconsin Statutes 20.20 (14). [3] Wisconsin Statutes 25.30. [4] Wisconsin Statutes 28.15. [5] Wisconsin Statutes Chapter 77.

Appendix II

SUMMARY OF THE TAYLOR GRAZING ACT

The serious condition of the uncontrolled eroding and overgrazed public range led to the enactment by Congress of the Taylor Grazing Act in 1934 (Act of June 28, 1934, 48 Stat. 1269, amended by Public, No. 827 of the 74th Congress, approved June 26, 1936). This act is designed to regulate grazing on approximately 142,000,000 acres of vacant, unreserved, and unappropriated public lands, almost all of which are within the boundaries of Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, and Wyoming. Small acreages are included in Washington, North Dakota, and South Dakota. It will be noted that of these 13 States only 6 are included within the area of the Great Plains.

The purposes of the act are, first, to prevent overgrazing and soil deterioration by means of conservation regulations providing for the orderly use, improvement, and development of the range, and, secondly, to stabilize the dependent livestock industry by administering the use of the public range land in such a manner that it will be possible for stock growers to plan their annual operations over a period of years, with knowledge, based upon the average rainfall, of the amount of grazing that will be available.

Grazing districts.—The act authorizes the Secretary of the Interior to establish grazing districts on any part of the unappropriated public domain valuable chiefly for grazing. The aggregate acreage to be included within grazing districts may not exceed 142,000,000 acres; no limitation is placed on the size of single districts. While districts may be composed only of public lands, privately-owned lands may be situated within their boundaries. Establishment of a district is effectuated by the issuance of an order defining the boundaries, after public notice and hearing within the proposed area.

In a few instances it has been necessary to establish district boundaries arbitrarily. In general the boundaries are determined by geographical barriers, such as rivers or mountain ranges, and by the express wishes of those to be affected. To date 48 districts have been established. Of this number, 37 are under administration and steps are being taken to bring the remaining 11, which were recently created, under administration. It is probable that 2 more districts, one in Colorado and one in Oregon, will be established in the near future. Only those areas which are predominantly public domain are included within grazing districts. The one exception to this is in Montana where the acreage of public land as compared with private land in some districts is as low as 20 to 25 percent.

Insurance of Grazing Permits.—Persons entitled to grazing privileges within districts are issued permits entitling them to graze stated numbers of specified classes of livestock during a stated season or seasons. The act provides that preference shall be given in the issuance of such permits to those persons within or near the district who are landowners engaged in the livestock business, bona fide occupants or settlers, or owners of water or water rights. Preference, however, is to be measured by the amount of grazing which is necessary to enable the applicant to make proper use of the lands, water, or water rights owned, occupied or leased by him. If there are insufficient grazing privileges to satisfy the needs of all those in the preferential class—that is, those having the dependent commensurate property described above—applicants who have a priority of use in such range and who are engaged in the livestock business are given an additional preference over applicants with dependent commensurate property but without priority of use. Grazing permits may be issued for a period not to exceed 10 years with a right of renewal in the holder at the discretion of the Secretary, provided there has been compliance with the rules and regulations.

The ideal administration would be an individual allotment for each applicant for range privileges. This is true for a number of reasons, but principally because an exclusive right to land carries with it a disposition to preserve the land's resources. However, large areas of the land under administration are so situated in relation to the privately-owned land that they cannot be used except by allotments in common. In general, a particular applicant is granted, as far as possible, the range tributary to his private holdings. Areas having a high

carrying capacity lend themselves readily to allotments in common, whereas areas of very low carrying capacity are more susceptible to individual allotments.

It has been recognized that some areas are best suited to winter grazing, some to summer grazing, others to spring and fall grazing, and still others to year-long grazing. There is little summer grazing on the public domain except in the States where year-long use is the custom. Regulation of the carrying capacity is brought about by a decrease either in the number of stock run or in the length of the season of use.

Ten-year permits cannot be issued prior to the making of a comprehensive and reliable range survey showing not only the carrying capacity of the public domain range, but also the ownership of the private dependent properties and the number of stock for which they are commensurate. The Division of Grazing therefore has issued temporary licenses to persons having dependent commensurate property with priority of use. To date approximately 15,000 licenses having a Class 1 rating have been issued. These licenses are temporary in character, but their issuance is a recognition that the dependent commensurate properties with priority of use on which they are based are entitled to some sort of a grazing privilege, the extent of which, however, has not yet been determined.

Local Advisory Boards.—Each of the 10 western States has been constituted a region under the act, and is under the supervision of a regional grazier. To avoid the establishment of a system which justly could be termed "absentee landlordism", and in order to receive the benefit of advice from those people who are not only best informed on the subject, but are also those whose property rights will be most affected, a system of local self-government has been provided which, to the fullest extent consistent with the terms of the Taylor Grazing Act, recognizes varying local conditions and customs.

Local autonomy has been achieved to a large extent by providing for the election in each district of a local advisory board whose members are chosen from qualified applicants for grazing privileges. These boards are under the supervision of the Division of Grazing and convene at the call of the regional grazier having charge of the region in which the district is located. Under the rules for administration of grazing districts approved by the Secretary of the Interior on March 2, 1936, the local advisers are authorized to make recommendations on the following matters:

1. The carrying capacity of the public range of the district;
2. The date before which the range must have been used by an applicant in order to have priority of use;
3. The issuance of grazing licenses (district advisers may not make any recommendations upon their own applications, which are acted upon by the Director of Grazing);
4. Proper rules for fair range practice;
5. Temporary range allotments by classes of livestock or for community or individual use;
6. Seasonal use of the public domain range, or any part thereof;
7. Approval or rejection in whole or in part of recommendations by local associations of stockmen in the district;
8. Other matters on which their opinion may be requested by the Secretary of the Interior.

The recommendations of the advisory board on the foregoing matters, as well as on any others pertaining to the welfare of the district, are approved by the regional grazier, unless the recommendation is clearly in violation of the act or of the administrative regulations. Great leeway thus is granted in order to give full weight to local conditions, customs, and usages.

Grazing Fees.—The act authorizes the Secretary to make a reasonable charge for the privilege of grazing livestock within a district. It provides that, of the money so collected, 50 percent is to be remitted to the State in which the district is located and the remaining 50 percent deposited in the Treasury of the United States. Twenty-five percent of the latter amount is pledged to appropriation for the improvement and rehabilitation of the range.

During the first year of administration no fees were charged for licensed stock. For 1936 all licenses have been charged at the rate of 5 cents per head per month for cattle, and 1 cent per head per month for sheep. These low fees were fixed to permit the livestock owners to adjust themselves gradually in the process of passing from a free range to a controlled range. Further, it was realized that a higher charge could not be justified until such time as the administration of the range could be sufficiently established to protect grazing and to make the range more productive.

Range Improvements.—The Secretary is authorized to rehabilitate overgrazed and eroded areas and to construct needed improvements, such as wells, reservoirs, fences and trails. Much work of this type already has been done. Forty-five Civilian Conservation Corps camps are utilized in this work. The local advisory boards have recommended the nature and location of most of the improvements made.

Conservation and Other Provisions.—The Secretary is authorized to increase or reduce the number of stock which may graze in a district; to designate the seasons of use and to do all things necessary to preserve the land and its resources from destruction and unnecessary injury, and to provide for the orderly use, improvement, and development of the public range. The act states that none of its

provisions shall restrict the right to hunt or fish in grazing districts, and the Secretary is directed to provide for co-operation with local associations of stockmen and State officials in the conservation and propagation of wildlife within the districts. The prospecting, locating, and developing of mineral resources on the public lands situated within districts are not affected by the establishment of the district.

Suitable allowance is made for wildlife in fixing the capacity of the public domain ranges, and provision is made for establishing game and bird refuges within districts. Areas determined to be more valuable for wildlife than for domestic stock are to be set aside for the higher use. All permittees are required to observe State and Federal game laws.

Lands within a grazing district may be homesteaded only in the discretion of the Secretary of the Interior after an examination and classification showing the lands to be more suitable for the production of agricultural crops than for the native grasses and forage plants.

The Secretary is authorized to exchange public lands within or without grazing districts with States and private individuals when the public interest will be benefited thereby. While progress to date in effecting exchanges has been slow, it is anticipated that exchanges henceforward will be made more rapidly.

The act also authorizes the Secretary to sell isolated tracts of the public domain, not exceeding 760 acres in area, after public notice, for not less than the appraised price. Contiguous landowners have a 30-day preference to purchase such lands at the highest price bid, but in no case may such an owner be required to pay more than three times the appraised price. The Secretary is further authorized to lease isolated tracts so situated as not to justify their inclusion in a grazing district. Such leases may be made only for grazing purposes, and may be properly conditioned to prevent overgrazing and improper use. If the tract involved embraces 760 acres or less, occupants have a preference only to the extent necessary to permit proper use of the contiguous lands. Little demand for the purchase of isolated tracts has arisen, but numerous applications have been made to lease such tracts. It is expected that one year leases will be extensively granted by the end of 1936.

Appendix 12

MONTANA GRAZING LAWS OF 1935, CHAPTER 195[1]

An Act to Provide for the Incorporation of Grazing District Associations to Share in the Conservation, Restoration, Improvement, and the Use of Forage Resources in the State of Montana; to Authorize Such Associations to Lease, Purchase or Otherwise Acquire County or Other Lands for Grazing Purposes and to Provide for the Management and the Use of Such Lands Which Will Best Conserve, Restore, and Improve the Forage Value Thereof; Providing for the Approval of By-laws of Such Corporations, Either Heretofore Existing or Hereafter Formed by the Montana Grazing Commission, Making Such Montana Grazing Commission the Supervisory Authority Over Cooperative Grazing Districts in Montana; Providing for the Fixing of Fees for the Administration of Such District and for the Administration of Grazing Districts Under Such Associations and Said Montana Grazing Commission, and to Amend Chapter 66, Laws of the Twenty-third Legislative Assembly of the State of Montana, 1933.

Be it enacted by the Legislative Assembly of the State of Montana:

Chapter 66, Laws of the Twenty-third Legislative Assembly of the State of Montana shall be, and the same is, hereby amended to read as follows:

SECTION 1.—*Articles of Incorporation.*—Whenever three or more qualified persons shall desire to incorporate a cooperative grazing district having for its object the utilization, conservation, restoration and improvement of forage resources on their lands or upon lands to be acquired by such association by purchase or lease, they shall prepare and file articles of incorporation to that effect in the office of the Secretary of State in the manner in this Act specified. Such articles shall be signed, sealed and acknowledged in the form now provided by the statutes of this state for the conveyance of real estate, and shall include the following:

(1) The name of the association.

(2) The purpose for which it is formed.

(3) The county or counties in which such district is located and the principal office or place of business of the association in the state.

(4) The membership fee for each member of the association which shall in no case be greater than Five Dollars ($5.00).

(5) The term for which such association is incorporated which shall not exceed forty (40) years.

(6) The names and residences of the persons who subscribe to and acknowledge such articles of incorporation, together with legal description of the lands owned or leased by each incorporator.

(7) Names and residences of those who have subscribed for membership, with a description of the lands owned or leased by each.

(8) The articles of incorporation shall hereafter be in substantially the following form:

ARTICLES OF INCORPORATION

1. The name of this association shall be: "........................ Cooperative Grazing Association."

2. This is a cooperative organization without capital stock and is not operated for profit. The purpose for which it is formed is to make possible the acquisition, control, conservation and beneficial use by its members of certain grazing lands lying in .... County or .... Counties, Montana, to the end that the members of the association may stabilize their farming and ranching operations.

3. The .... Cooperative Grazing District shall be situated wholly within the boundaries of .... County, within the boundaries of .... Counties, Montana, and the office of the association shall be located in .... County, Montana.

4. The membership fee of this association shall be Five Dollars ($5.00) per member.

5. This association shall have a corporate life of forty (40) years.

[1] Laws, Resolutions and Memorials of the State of Montana Passed by the Twenty-fourth Legislative Assembly in Regular Session.

6. The individuals who subscribe to membership and acknowledge these articles of incorporation, together with their respective residences and the legal description of their lands, is as follows:

Name	Address	Description of Land (Either Owned or Leased)
....	....	....
....	....	....
....	....	....

IN WITNESS WHEREOF, the said parties of the first part have hereunto set their hands and seals this .... day of ...., 19.....

Signed, Sealed and Delivered in the Presence of—

....

....

....

....

....

COUNTY OF............ }
STATE OF MONTANA } *ss:*

On this .... day of ...., 19...., before me, ..., a Notary Public for the State of Montana, personally appeared .... and .... known to me personally to be the persons whose names are subscribed to the within instrument; and acknowledged to me that they executed the same.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and year in this certificate first above written.

.............................,

Notary Public for the State of Montana.

My Commission expires ....

Residing at ....

SECTION 2. *Powers.*—Each association organized under this Act shall have the following powers:

(1) To lease or acquire, by purchase or otherwise, lands for grazing purposes or for raising forage crops and to dispose of such lands by trade, sale, or otherwise.

(2) To construct or acquire fences, reservoirs, or other facilities for the care of livestock.

(3) To lease from the county or counties in which the cooperative grazing district is located, land acquired by such county or counties through tax sale or otherwise, which is located in or contiguous thereto and not already under lease.

(4) To apportion to members grazing rights within such district on such terms, conditions, and limitations as may be specified by the directors thereof, or in accordance with the terms and limitations imposed for the purpose of conservation, restoration, and improvement of forage resources in the leasing of county, state, or Federal land.

(5) To issue or cause to be issued permits to graze livestock on such grazing districts to association members, bona fide residents, lessees of lands, and other stock owners, having, in each case commensurate lands, pursuant to the by-law and rules and regulations of the association, approved by the Montana Grazing Commission. Such permittees shall be entitled to participate in the use of the range upon the payment, annually, of reasonable fees in each case to be fixed or determined from time to time by the directors of the association, provided that grazing permits shall be issued only to residents of the State of Montana and to individuals, associations, or corporations authorized to conduct business under the laws of the State of Montana and actually engaged in the raising of livestock. Preference shall be given in the issuance of grazing permits to those within or near a district who are members of the association or land owners or lessees engaged in the livestock business within or near said grazing district. The commensurability of such members or applicants shall be the basis of issuing permits for the proper use of lands owned, occupied, or leased by them. Such permits shall be for a period of not more than ten (10) years, subject to the preference right of the permittee to renewal.

SECTION 3. *Members.*—Any person, partnership, association, corporation or legally authorized agent of either thereof owning or leasing forage producing land within or near the proposed boundaries of any cooperative grazing district set up by any association incorporated under this Act, shall be entitled to become a member of such association by paying the membership fee and by subscribing to the by-laws and by complying with the regulations fixed by the grazing district as approved by the Montana Grazing Commission. When any member shall dispose of the lands owned or leased by him within or near the cooperative grazing district so that he is no longer the owner of such lands or leases commensurate with his permit, then such person shall cease to be a member of such association and his rights and interests in the association shall thereupon pass to the purchaser thereof. When any member shall dispose of a part of the lands or leases owned by him so that another shall become the owner of such lands or leases and acquire right to membership, then the rights and interests involved shall be determined by the Board of Directors of the association based upon the commensurability of the lands or leases in such new relationship.

SECTION 4. *By-laws.*—Each association incorporated under this Act shall within thirty (30) days after its incorporation adopt a code of by-laws by a majority vote of its members for its government and management, not inconsistent with the powers granted under this Act,

and before such code of by-laws becomes effective it must be submitted to and be approved by the Montana Grazing Commission, in order that so far as possible there may be uniformity in the regulations and by-laws of all cooperative grazing associations now existing or hereafter formed under the laws of the state.

Each association incorporated under the provisions of Chapter 66 of the Session Laws of the Twenty-third Legislative Assembly of the State of Montana, 1933, shall within thirty (30) days after the passage and approval of this Act, by majority vote of its members, amend its existing by-laws so far as may be necessary to conform with the provisions of this Act, not inconsistent with the powers granted under this Act, which said amended by-laws shall, before becoming effective, be submitted to and be approved by the Montana Grazing Commission. Such by-laws shall provide for:

(1) The time, place and manner of calling and noticing meetings of the association and of its Board of Directors.

(2) The number of members constituting a quorum at any meetings.

(3) The number of directors of the association, their tenure of office, and the time and manner of their election; the officers of the corporation, their tenure of office, the manner of their election and their duties.

(4) Suspension of rights, loss of privileges and grazing permits for violation of such by-laws, or of any regulation, limitation or restriction imposed for the conservation of forage within the district.

(5) The manner of filling vacancies in the Board of Directors of any office.

SECTION 5. *Directors, Powers and Duties.*—

(1) The directors shall possess the full corporate power of the association as authorized in this Act.

(2) The directors shall make regulations for the management and control of the affairs of the association and of the manner of utilization of grazing and range development within their respective districts. Such regulations before becoming effective, shall be submitted to and be approved by the Montana Grazing Commission.

(3) The directors shall apportion grazing rights within their districts to members on a commensurate basis as may be defined by the by-laws and regulations of the associations.

(4) To grant to non-members grazing permits within such districts when the amount of forage within the district is greater than the need of the members.

(5) To determine grazing fees to be imposed on members or non-members on a per-head basis for grazing rights or to determine assessments on members on a per-head grazing basis for the purchase of lands situated within, contiguous to, or adjacent to such districts.

(6) On behalf of the association, to enter into leases with persons, corporations, partnerships, or with the county or counties in which the district is located or with the State or the Federal Government for tracts of land within, contiguous to, or adjacent to such districts.

(7) To specify the breed, quality and number of male breeding animals which each member must furnish when stock are grazed in a common pasture within the grazing district.

SECTION 6. *Filing Map of District.*—Cooperative grazing associations organized under this Act shall, upon completion of organization and incorporation, file with the County Clerk of the county or counties in which such lands lie, a map or plat of the grazing district proposed to be created. If such district shall contain land situated in more than one county, then a map or plat of such grazing district shall be filed with the County Clerk of each county in which such lands lie. Whenever any incorporated grazing association shall enlarge or reduce the area included within its district, or change or modify its boundaries, it shall file with the County Clerk or Clerks, a map or plat to indicate such changed boundaries.

SECTION 7. *Leasing and/or Purchase of Lands.*—Any incorporated grazing association may purchase or lease any and all lands owned by the United States, the State of Montana, any county, corporation or individual on such terms as may be lawfully negotiated in each case.

In negotiating the terms of any lease with a cooperative grazing district, County Commissioners may provide for a variable scale of rental charges, based on market prices for livestock and/or livestock products, or on the number and character of stock to be grazed in said district.

SECTION 8. *Reserves.*—The association, after paying all costs, lease rentals, or other expenses, may set up such reserve for contingencies as in its judgment is advisable.

SECTION 9. *Distribution of Interests upon Dissolution.*—Whenever any cooperative grazing district is dissolved by act of its Board of Directors or otherwise, in accordance with the general law relative to dissolution of corporations, then the rights and interests therein shall be distributed among the members in proportion to the amounts paid in by the various members as assessments, as nearly as the Board of Directors may determine.

SECTION 10. *Amendments.*—By-laws may be altered or amended at any meeting of the members, legally called and noticed by a two-thirds vote of the members present, but such by-laws so altered or amended must before becoming effective be submitted to and be approved by the Montana Grazing Commission.

SECTION 11. *Appeals.*—In the event of dispute between a member of an association and the association itself, or between two or more associations, appeal may be made to the Montana Grazing Commission, as in this

Act provided. The record in the case may be prepared pursuant to stipulation of the parties, or, if they fail to agree thereon, the record may be settled by the Montana Grazing Commission.

SECTION 12. *Appeal to Courts.*—The action of the Montana Grazing Commission in such appeals shall be final, save and except that an interested party may seek review of the action of the Montana Grazing Commission in a district court of the county where the dispute or controversy arose within thirty (30) days after such decision of the Montana Grazing Commission, and trial of the issue in such court may be had on the record made before the Montana Grazing Commission or de novo. The district court may affirm, reverse or nullify the decision of the Montana Grazing Commission. Appeals may be prosecuted from the judgment of the district court to the Supreme Court of Montana as in other cases.

SECTION 13. *Saving Clause.*—Chapter 66, Laws of the Twenty-third Legislative Assembly of the State of Montana, 1933, shall be, and the same is hereby, amended, save and except that as to any grazing districts organized under and pursuant to such Act, this amendment shall not affect, impair, or destroy any of the rights and powers by such association pursuant to the provisions of said Chapter 66, and such associations so organized shall continue and be in full force and effect, subject, however, to the terms and conditions of this Act.

SECTION 14. This Act shall be in full force and effect from and after its passage and approval.

W. P. PILGERAM,
Speaker of the House.
ERNEST T. EATON,
President of the Senate.

Approved, March 18, 1935.
F. E. COONEY, *Governor.*

Appendix 13

MONTANA GRAZING LAWS OF 1935, CHAPTER 194[1]

An Act to Create the Montana Grazing Commission, Providing the Membership Thereof, and for the Appointment of a State Grazing Administrator; Defining the Powers and Prescribing the Duties of Said Commission, Granting Said Commission Authority to Impose Fees on Grazing Associations Organized Under the Laws of the State of Montana, to Defray the Expenses of the Said Commission Within the Limits of This Act; Providing for the Administration of This Act, the Powers and Duties of Said State Grazing Administrator, Prescribing an Annual Report; Providing for Cooperation With the United States and the Director of Grazing Under the Taylor Grazing Act.

Be it enacted by the Legislative Assembly of the State of Montana:

SECTION 1. *Purposes.*—In order to administer, regulate, and improve such grazing districts as are now incorporated, or as may hereafter be incorporated, under the laws of the State of Montana, and to make such rules, regulations and establish proper services and standards therefor, enter into cooperative agreements, to insure full realization of the objects of such grazing districts, establish more uniform by-laws and regulations within and among the said various cooperative grazing associations now existing or which may be hereafter incorporated, and in order to effect full cooperation with the Director of Grazing under the Taylor Grazing Act, to work out the economic use of the grazing areas of the State of Montana, to establish uniform rules and regulations for the issuance of grazing permits by cooperative grazing associations to the most commensurate and most dependent members, residents, users, and/or livestock operators within any such areas, such utilization, however, to be so conducted as to maintain maximum, continuous production consistent with such use, to provide when and where necessary, for restoration of said natural forage resources, and do any and all things necessary to accomplish a sound administration of grazing areas in Montana, this Act is adopted.

SECTION 2. There is hereby created the Montana Grazing Commission of the State of Montana hereafter called the "Commission." The Montana Grazing Commission shall consist of a board of five (5) members who shall be appointed by the Governor as provided in this Act. The Governor shall select one (1) member from the Montana Wool Growers' Association; and one (1) member from the Montana Livestock Growers' Association; and one (1) member from the Board of County Commissioners' Association; and one (1) member from the Incorporated Grazing Association, under the laws of the State of Montana and one (1) member as a representative of the Director of Grazing under the Taylor Grazing Act (Public, No. 482, U. S. Congress approved June 28, 1934).

Three (3) of such members so appointed by the Governor, shall serve for a term of one (1) year and two (2) of such members so appointed by the Governor, shall serve for a term of two (2) years and upon the expiration of said respective terms, all members thereafter shall be appointed under this Act, the length of their respective terms of office shall be determined by lot.

In the event of a vacancy or vacancies upon the commission, the Governor shall within sixty (60) days fill such vacancy from the group from which said vacancy shall occur.

The commission shall hold a regular meeting at Helena, at least once in each quarter period of the year, and such other meetings at any point in Montana as may be required in the conduct of the business of the commission, or as may be proper in the administration of this Act and related Acts.

SECTION 3. The commission at its first meeting shall nominate three (3) persons, citizens of the State of Montana, for submission to the Governor, who shall from the list of such nominees appoint one who shall act as the State

[1] Laws, Resolutions and Memorials of the State of Montana Passed by the Twenty-fourth Legislative Assembly in Regular Session.

Grazing Administrator for the State of Montana. Such administrator shall hold office for a term of one year. Upon the expiration of his term of office his successor shall be nominated and appointed in like manner.

SECTION 4. *Powers and Duties of Commission.*—The Commission shall make provision for the protection, administration, regulation and improvement of such grazing districts as may now exist under and by virtue of Chapter 66 of the Session Laws of Montana, 1933, as amended, and as may hereafter be created under and by virtue of any similar laws in the State of Montana. It shall make such rules and regulations and establish such service, enter into such cooperative agreements and do any and all things necessary to insure the objects and purposes of such grazing districts, namely to regulate and coordinate the regulations and by-laws of all districts formed under the State law as to the occupancy and use thereof, to preserve the land and its resources from destruction and unnecessary injury, and generally to provide for the orderly use, improvement and development of the range, and provide for stock passes and drives as may be necessary and proper over, across and through said districts.

SECTION 5. The members of the commission shall be allowed their actual expenses and Ten Dollars ($10.00) per diem for and while attending meetings, such expenses to be audited, allowed, and paid as in the case of other expenditures of said commission.

SECTION 6. The commission shall have power to fix the salary of the State Grazing Administrator appointed by the Governor, as above prescribed, and to appoint such other agents and employees, and incur such expenses as may be necessary for the proper conduct of the business of the commission. The State Grazing Commission shall have authority and right to impose such fees against the several grazing associations of the State of Montana and in an amount not in excess of Five Cents (5¢) per head per "Cow Unit" and One Cent (1¢) per head for mature sheep, five (5) mature sheep being considered a "Cow Unit", to defray any and all expenses created by the State Grazing Commission, and said State Grazing Commission shall from such fees and collections repay to the State Treasurer of Montana any and all appropriations provided by the State of Montana for the establishment of this commission and the administration of this Act when so collected. When such appropriation by the State of Montana is repaid, the balance of such funds shall be held in the state grazing fund, hereinafter created, to be expended by order and direction of the State Grazing Commission for the further administration of the commission, and thereafter said commission shall be maintained by funds obtained from the livestock fees hereinbefore provided.

SECTION 7. *Powers and Duties of Administrator.*—The State Grazing Administrator shall be the executive officer of the commission and shall be controlled and directed by the rules and regulations established by the commission from time to time and applicable to him.

SECTION 8. It shall be the duty of the commission to audit all bills for expenses incurred by it or the administrator in the discharge of the duties of the commission, and when found correct to certify the same to the Board of Examiners of the State of Montana, and when the same are approved by said board, it shall transmit such claims to the State Auditor, who shall thereupon draw a warrant upon the State Treasurer in favor of the party or parties entitled thereto for the amounts so certified and approved, which warrants shall be drawn upon and paid out of the state grazing fund. Said state grazing fund is hereby created and shall consist of the fees paid to said Commission therefor and other funds hereafter or heretofore appropriated for said commission and placed to the credit of said fund.

SECTION 9. *Annual Report.*—The commission must make an annual report, in writing, to the Governor, on the first day of January of all its transactions for the preceding year.

SECTION 10. *Powers and Duties of the Commission.*—The commission shall be and act as the official and final appellate board in all cases of appeal to it (a) between a member or members of a cooperative grazing association and such association and (b) between grazing associations in the State of Montana.

In addition to the powers of the commission hereinbefore enumerated, the commission shall have power and authority to settle, adjust, and approve mutual agreements between grazing associations and owners or users within or adjoining grazing districts, to determine and agree upon an acceptable division fence or barrier, which may be separately or jointly constructed and maintained, such fence as may be agreed upon to be as binding as any other fence prescribed by law. In the event the kind of fence or barrier cannot be agreed upon, then the commission shall have authority and it is hereby empowered to determine the kind of barrier or fence required or what acts or encroachments of stock shall constitute trespass within the grazing district.

SECTION 11. All Acts and parts of Acts in conflict herewith are hereby repealed.

SECTION 12. This Act shall be in full force and effect from and after its passage and approval.

W. P. PILGERAM,
Speaker of the House.
ERNEST T. EATON,
President of the Senate.

Approved, March 18, 1935.
F. E. COONEY, *Governor.*

Appendix 14

NEW MEXICO LEGISLATION RELATING TO UNDERGROUND WATER

NEW MEXICO SESSION LAWS OF 1935, CHAPTER 43 [1]

An Act Relating to Artesian Wells and Artesian Basins; Providing for the Control and Regulation of Artesian Wells; Giving Authority to the State Engineer to Promulgate Rules and Regulations Governing the Drilling, Casing, Repairing, Plugging, and Abandonment of Artesian Wells; Defining Waste of Artesian Waters, Declaring Such Waste to be a Public Nuisance, Prescribing Penalties for the Violation of the Provisions of this Act, and Repealing the Provisions of Chapter 6 of the New Mexico Statutes Annotated, Compilation of 1929, and Declaring an Emergency.

Senate Bill No. 66; Approved February 10, 1935.

Be it enacted by the Legislature of the State of New Mexico:

SECTION 1. *Definition of artesian well.*—An artesian well for the purposes of this Act is hereby defined to be an artificial well which derives its water supply from any artesian stratum or basin.

SEC. 2. *Supervision of artesian waters.*—All artesian waters which have been declared to be public waters shall be under the supervision and control of the State Engineer, as provided by this Act, but where Artesian Conservancy Districts have been duly organized pursuant to Chapter 97 of the New Mexico Session Laws of 1931 and Acts amendatory thereof, such Districts shall have concurrent power and authority with the State Engineer to enforce the regulatory provisions, as herein provided, in so far as the waters to be conserved and controlled by the respective Districts are affected.

This Act shall not be construed to affect the provisions of Chapter 131 of the New Mexico Session Laws of 1931, being "An Act relating to underground waters, declaring certain underground waters to be public waters and relating to the beneficial appropriation thereof and repealing Article 2 of Chapter 151 of the New Mexico Statutes Annotated, 1929 Compilation", and the State Engineer may intervene on behalf of the State in any proceeding brought by or against any Artesian Conservancy District where it is necessary for the proper protection or adjudication of rights to the public waters of the State.

SECTION 3. *Artesian well supervisor.*—The County Commissioners of any County wherein an Artesian Basin is situated and wherein an Artesian Conservancy District has not been organized may employ with the consent and approval of the State Engineer an Artesian Well Supervisor and any assistants deemed necessary, who shall be under the supervision of the State Engineer, and it shall be the duty of such Well Supervisor, and his assistants, to enforce the regulatory provisions of this Act and the rules and regulations promulgated by the State Engineer pursuant hereto. The salaries of such Well Supervisor and his assistants shall be fixed by the Board of County Commissioners, who shall levy a special tax for such purpose upon all taxable property situated within the County wherein such Artesian Basin is situated, which levy shall be exclusive of the limit now provided by law; Provided, however, that at no time shall such tax levy produce a revenue in any one year of more than Seventy-Five Hundred ($7,500.00) Dollars. All funds derived from such tax levies shall be transmitted by the County Treasurer to the State Treasurer on or before the last day of March, June, September and December of each year. The State Treasurer shall deposit such funds to the credit of the Artesian Well Fund of the County providing the same and shall disburse the same for expenses incurred by said County relative to the administration of the provisions of this Section of this Act, upon warrants of the State Auditor supported by proper itemized vouchers approved by the State Engineer.

SECTION 4. *Rules and regulations.*—The State Engineer shall prescribe and enforce reasonable rules and regulations consistent with the terms of this Act governing the drilling, casing, repairing, plugging, and abandonment of artesian wells, and, where necessary, may vary such rules and regulations with the varying conditions in the differ-

[1] Laws of the State of New Mexico Passed by the Twelfth Regular Session of the Legislature of the State of New Mexico.

ent Artesian Basins; Provided, however, that the State Engineer shall first consult with the Board of Directors of the Artesian Conservancy District in any such Artesian Basin to the end that such rules and regulations shall properly meet the requirements of such Artesian Basin.

The owner of the lands upon which any artesian well is situated or is to be drilled or his or its agent or attorney shall make application to the State Engineer for permit to drill, repair, plug or abandon an artesian well, setting forth the plan of operations to be performed, which shall conform with the provisions of this Act and the rules and regulations promulgated pursuant thereto, and said application shall be approved by the State Engineer before work thereon can proceed.

Before proceeding with any such work, the State Engineer shall require, either of the owner of the land upon which the work is to be performed or of the contractor who is to perform the same, a bond approved by the State Engineer in the sum of not to exceed Five Thousand ($5,000.00) Dollars, conditioned upon the proper compliance with the provisions of this Act and all rules and regulations promulgated pursuant thereto. Such bond shall be made payable to the State of New Mexico for the use and benefit of the State Engineer. In the event of the breach of the conditions of the bond and upon failure or refusal of the principal to comply with the provisions thereof, it shall be the duty of the State Engineer to condition said artesian well to conform with the provisions of this Act and the rules and regulations pursuant thereto and to recover on account of said bond the expense of such work, excepting that in no case shall the sum recovered exceed the amount of the bond. The State Engineer and those authorized by him may go upon the land where the well is situated to perform such work as he shall deem necessary and the owner thereof shall be deemed to have consented thereto by his act of filing the Application for Permit to perform the work as above provided. The well shall be inspected by the State Engineer or his representatives as soon as practicable and within ninety days after the receipt of notice that the work has been completed, and upon written acceptance of such work by the State Engineer, said bond shall thereupon be of no further force or effect, and the bondsmen shall be relieved from further liability thereunder.

SECTION 5. *Drilling record.*—Any contractor drilling a well within any Artesian Basin where such well is drilled down to or through any artesian stratum shall keep a complete record and log of the well, recording the depth, thickness and character of the different strata penetrated, together with the dates when the work was begun and completed, and the amount, weight, and size of casing set, and number of inches of flow from such well above the casing, all of which he shall verify under oath, and when the well is completed shall file the same with the State Engineer or Artesian Well Supervisor, and a duplicate thereof, if the well is situated within any Artesian Conservancy District, with the officials of such District.

SECTION 6. *Definition of waste.*—For the purposes of this Act, waste is defined as causing, suffering, or permitting any artesian water to reach any pervious stratum above the artesian strata before coming to the surface of the earth, or causing, suffering, or permitting any artesian well to discharge unnecessarily upon the surface of the ground so that the waters thereof are lost for beneficial use; provided, however, that nothing herein contained shall be construed to prevent the use of such waters for ornamental ponds or fountains.

SECTION 7. *Abandoned wells wasting water declared to be a public nuisance.*—Any artesian well which has been abandoned for more than four years, from which the right to the use of the waters has reverted to the State and which is found to be wasting the waters from any Artesian Basin is hereby declared to be a public nuisance, and the State Engineer, his representatives, or the Artesian Conservancy District in which the well is located may abate such nuisance in a summary manner, without notice to the owner, by plugging or otherwise controlling the same.

SECTION 8. *Waste of water on surface.*—The owner of any artesian well which is being beneficially used or which under existing water rights may be beneficially used, who causes, suffers or permits the waters therefrom after coming to the surface of the earth to waste as herein defined, shall be guilty of a misdemeanor. Such waste is also hereby declared to be a public nuisance, and in the event of the failure or refusal of the owner of the well to abate the same, within ten (10) days from receipt of Notice by Registered Mail, Return Receipt Requested, from the State Engineer, Artesian Well Supervisor, or Artesian Conservancy District, if the well is situated therein, such officials having jurisdiction may abate such nuisance in a summary manner without further notice by properly fitting the well with necessary valves or other devices or doing whatever shall be necessary to control the flow of water therefrom and prevent such waste, and the cost thereof shall be a lien against the land upon which the well is situated, as well as any land the owner or owners of which have a legal right to the use thereon of all or a part of the water from such well in so far as the interests of the several owners may appear, together with all improvements thereon from the time the work is begun or labor and materials necessary to abate the nuisance are furnished, subject only to regularly assessed taxes and liens of record prior to the time of the commencement of the work: Provided, however, a claim of lien therefor under oath of the State Engineer, Artesian Well Supervisor, or an officer of an Artesian Conservancy District, as the case may be, is filed in the office of the County Clerk of the County wherein such

well is situated, within five days from the time of the completion of the work, said claim of lien to be addressed to the owner or owners of the land upon which the well is situated, and to whom it may concern, giving a description of the land to be charged with the lien, the nature of the work, the time commenced and the time completed, together with the cost thereof. Said lien may be foreclosed in the same manner as provided by law for the foreclosure of mortgages at any time after one year but not more than three years from the date of filing the same. The County Clerk shall make no charges for filing the claim of lien, and no costs shall be taxed against the plaintiff in any foreclosure proceeding on account thereof.

SECTION 9. *Conducting water so as to prevent waste.*—It shall be unlawful for any owner, person, or corporation using the waters from any artesian well to conduct the same through any ditch, channel or conduit such that more than twenty (20) percent of the waters are lost between the point of appropriation and the point of beneficial use. In no case shall water be conducted from an artesian well drilled after September 6, 1912, a distance greater than one and one-half miles in an earthen ditch or two miles through a concrete lined ditch or other impervious conduit, excepting for drilling purposes or where such waters shall be conducted in pipes for domestic or industrial purposes; Provided, however, that waters from artesian wells drilled subsequent to September 6, 1912, to replace wells drilled prior to that date, the waters from which were being conducted further than the above mentioned distances, shall not be restricted as to the distance which they may be conducted.

Where the waters from artesian wells are conducted through canals together with waters from other sources, it shall be unlawful for any owner, person or corporation using said waters to suffer or permit the waste of more than twenty (20) percent thereof in conducting the same from point of appropriation of the artesian waters to the place of beneficial use.

SECTION 10. *Reservoirs.*—When reservoirs are constructed to be used for storage of water from artesian wells the capacity shall not be greater than that sufficient to hold the continuous maximum flow of water from such wells for a period of more than forty-eight (48) hours, excepting that where the maximum discharge of such wells is less than three hundred (300) gallons per minute such reservoirs may be of sufficient capacity to hold the maximum continuous flow thereof for a period of ninety-six (96) hours. Such reservoirs shall be constructed and used only for irrigation purposes. It shall be the duty of the Artesian Well Supervisor and officials of any Artesian Conservancy District or agents or employees designated for that purpose to inspect all reservoirs and main ditches and laterals connected therewith as to construction, both as to workmanship and materials used, and to determine the losses therefrom by seepage and evaporation. If any reservoir and distribution system shall show a loss of more than twenty (20) percent of the water from the artesian well to the place of beneficial use, the investigating official shall notify the owner thereof, or his agent or person using the same, that such reservoir and distributing system are in defective condition and that it shall be unlawful to make further use of the same until they are repaired or reconditioned so as to lose by reason of seepage and evaporation not more than twenty (20) percent of the waters appropriated. The use of such reservoir for storage purposes after the owner, his agent or the person using the same has received notice shall be deemed a misdemeanor, punishable as provided in this Act, and also a public nuisance, and the State Engineer, Artesian Well Supervisor, or Artesian Conservancy District having jurisdiction may abate such nuisance in a summary manner and claim a lien for the actual costs thereof as provided in Section 8. After repairs have been made pursuant to such notice, it shall again be inspected by such official and if found to be so repaired or reconstructed so as to conserve the waters therein, as herein provided, the official inspecting the same shall issue to the owner, or his agent or the person using the same, his written approval thereof.

SECTION 11. *Using water for stock purposes.*—It shall be unlawful to use water from any artesian well for the purpose of watering stock, except where such water shall be carried through pipes to watering troughs fitted with float feeds or other means of control to prevent waste therefrom.

SECTION 12. *Violation made misdemeanors.*—Any person or corporation violating any of the provisions of Sections 4, 5, 8, 9, 10, and 11 of this act or any of the rules and regulations promulgated by the State Engineer in conformity therewith, and each day such violation shall continue shall constitute a separate offense, and upon conviction thereof shall pay a fine of not less than Twenty-five ($25.00) Dollars nor more than Two Hundred Fifty ($250.00) Dollars for each offense. The State Engineer, Artesian Well Supervisor, or any Director of an Artesian Conservancy District or other officer charged with the enforcement of this Act, may file a complaint with the proper official against anyone for the violation of any of the provisions hereof.

SECTION 13. *Where provision of act may be unconstitutional.*—Should any provision of this Act be held unconstitutional, the same shall not affect any of the other provisions thereof.

SECTION 14. *Repealing clause.*—That Chapter 6 of the New Mexico Statutes Annotated, Compilation of 1929, and all laws in conflict herewith, be, and the same are hereby, repealed.

SECTION 15. *Emergency clause.*—That it is necessary for the preservation of the peace, health and safety of the inhabitants of the State of New Mexico that this Act become effective at the earliest possible time, and therefore an emergency is hereby declared to exist and this Act shall be in full force and effect upon and after its passage and approval.

NEW MEXICO SESSION LAWS OF 1931, CHAPTER 131, AND AMENDMENTS THERETO AS CONTAINED IN CHAPTER 122, SESSION LAWS OF 1933

Be it enacted by the Legislature of the State of New Mexico:

SECTION 1. The waters of underground streams, channels, artesian basins, reservoirs, or lakes, having reasonably ascertainable boundaries, are hereby declared to be public waters and to belong to the public and to be subject to appropriation for beneficial use.

SECTION 2. Beneficial use is the basis, the measure and the limit to the right to the use of the waters described in this act.

SECTION 3. Any person, firm or corporation desiring to appropriate for irrigation or industrial uses any of the waters described in this act shall make application to the State Engineer in a form to be prescribed by him in which said applicant shall designate the particular underground stream, channel, artesian basin, reservoir, or lake from which water is proposed to be appropriated, the beneficial use to which it is proposed to apply such water, the location of the proposed well, the name of the owner of the land on which such well will be located, the amount of water applied for, the use for which it is desired and if the proposed use is irrigation, the description of the land to be irrigated and the name of the owner thereof.

Upon the filing of such application the State Engineer shall cause to be published in a newspaper of general circulation in the county wherein the proposed well will be located, for at least once a week for three consecutive weeks, a notice of the filing of such application, and that objections to the granting thereof may be filed within ten days after the last publication of said notice.

After the expiration of the time for filing objections, if no such objections shall have been filed, the State Engineer shall, if he finds that there are in such underground stream, channel, artesian basin, reservoir or lake, unappropriated waters, grant the said application and issue a permit to the applicant to appropriate all or a part of the waters applied for subject to the rights of all prior appropriators from said source.

If objection or protest shall have been filed within the time in said notice specified the State Engineer shall set a date for a hearing on the application and the objections or protest thereto, and shall notify the applicant and the objectors or protestants thereof. Such hearing shall be held in the court house of the county in which the proposed well will be located. If after such hearing it shall appear that there are no unappropriated waters in the designated source, or that the proposed appropriation would impair existing water rights from such source, the application shall be denied.

SECTION 4. Existing water rights based upon application to beneficial use are hereby recognized. Nothing herein contained is intended to impair the same or to disturb the priorities thereof.

SECTION 5. Any person, firm or corporation claiming to be the owner of a vested water right from any of the underground sources in this act described, by application of waters therefrom to beneficial use, may make and file in the office of the State Engineer a declaration in a form to be prescribed by the State Engineer setting forth the beneficial use to which said water has been applied, the date of first application to beneficial use, the continuity thereof, the location of the well, and if such water has been used for irrigation purposes, the description of the land upon which such water has been so used and the name of the owner thereof. Such declaration shall be verified but if the declarant cannot verify the same of his own personal knowledge he may do so on information and belief. Such declarations so filed shall be recorded at length in the office of the State Engineer and may also be recorded in the office of the County Clerk of the county wherein the well therein described is located. Such records or copies thereof officially certified shall be prima facie evidence of the truth of their contents.

SECTION 6. Declarations heretofore filed in substantial compliance with Section 5 hereof shall be recognized as of the same force and effect as if filed after the taking effect of this act.

SECTION 7. The owner of a water right may change the location of his well or change the use of the water, but only upon application to the State Engineer and upon showing that such change or changes will not impair existing rights, and to be granted only after such advertisement and hearing as are prescribed in the case of original applications.

SECTION 8. When for a period of four years the owner of a water right in any of the waters described in this act shall have failed to apply the same to the use for which the right has vested, was appropriated or shall have been adjudicated, such water right shall be forfeited and the water so unused shall revert to the public and be subject to further appropriation.

SECTION 9. Upon the taking effect of this Act, the State Engineer shall, by regulations establish the fees to be paid by applicants and declarants, which fees shall not exceed the reasonable cost of the service to be performed by the State Engineer, and the applicant shall pay to the pub-

lisher the cost of the necessary advertising, and before ordering any hearing the State Engineer shall require the applicant and protestant, or protestants, to each deposit with him a sum equal to the estimated cost of the hearing and, after the decision, the State Engineer shall refund to the prevailing party or parties the sum so deposited by him or them and shall refund to the losing person or persons any unused portion of the moneys deposited by them. All fees collected under the provisions of this Act shall be deposited with the State Treasurer and by him covered into the "Underground Water Fund" to be withdrawn by the State Engineer, upon vouchers properly audited, for the purpose of administering this Act.

SECTION 10. The decision of the State Engineer shall be final in all cases unless appeal be taken to the District Court within thirty days after his decision, as provided by Section 151-173 of the 1929 New Mexico Statutes Annotated.

SECTION 11. The State Engineer is hereby given the power and it is made his duty to formulate rules and regulations for the purpose of carrying out the provisions of Act, which rules and regulations shall be printed and made available for distribution to all applicants.

SECTION 12. That Article 2 of Chapter 151, New Mexico Statutes Annotated, 1929 Compilation, be and the same is hereby repealed.

Appendix 15

UNIFORM UNDERGROUND WATER LAW FOR WESTERN STATES SUGGESTED BY A COMMITTEE OF THE WESTERN STATE ENGINEERS' ASSOCIATION

SECTION 1. The waters of underground streams, channels, artesian basins, reservoirs, lakes, or other bodies of *underground water moving in a definite lateral direction,* having boundaries scientifically ascertainable, are hereby declared to be public waters and to belong to the public and to be subject to appropriation for beneficial use under the terms of this act and not otherwise. The provisions of (here cite the laws regulating the appropriation and adjudication of rights to surface waters, provided the constitution of the State permits the extension of existing laws by reference to their titles and without quoting the provisions in full)[1] insofar as the same are applicable, *and except as modified herein, shall govern the acquisition* and protection of rights to underground waters.

SEC. 2. Beneficial use is the basis, the measure, and the limit to the right to the use of the waters described in this act.

SEC. 3. The State Engineer shall administer this act and shall prescribe all necessary rules and regulations for such administration. The State Engineer shall designate administrative underground areas and sub-areas. His findings shall be published once a week for three consecutive weeks in each county in the area affected, and shall be final unless appeal be taken to the district court in the county in which the largest portion of the administrative area or sub-area is situated within 30 days after the last publication. Priorities to underground waters shall relate to such area and/or sub-areas. The State Engineer may require periodical statements of water elevations, water used, and acreage on which water was used from all holders of permits and claimants of vested rights.

SEC. 4. No appropriation of underground waters *described in this act shall be made, and no well shall* be drilled or dug or tunnel constructed for such purpose, until application to the State Engineer shall have been approved and permit granted by him. (Insert details of publications, filing of objections, hearings, and findings.) *The State Engineer shall find as to whether* there is unappropriated water in the area affected and shall issue the permit only if such finding is affirmative. Any person aggrieved may appeal to the district court within 30 days after such findings are issued.

SEC. 5. Users of water from small domestic wells, as the State Engineer shall define them, are exempted from the provisions of this act except as to the furnishing of any information required by the State Engineer.

SEC. 6. Vested rights shall not be interfered with and *all existing vested rights are hereby confirmed.* Use of a certain measure of underground water from a certain outlet, for beneficial and economical application to certain described land, or for a certain industrial, municipal, or other non-domestic use, during at least one of the last three years preceding the date of this act and not heretofore abandoned, is hereby declared to constitute a *vested right. All claimants to vested rights shall file* notice with the State Engineer, on forms prescribed by him, within one year after the date of this enactment.

SEC. 7. The State Engineer at any time may hold a hearing on his own motion or upon petition signed by 50 or one-fourth of the users of underground water in any area or sub-area, to determine whether the water supply within such area or sub-area is adequate for the needs of of all permitters and vested right claimants in good standing. If the finding is negative, the State Engineer shall order that withdrawals be restricted in order of priority during period of shortage.

SEC. 8. Non-use of water for four successive years by any permit holder or vested right claimant shall work a forfeiture of the right. The State Engineer shall hold hearings on forfeitures, following the procedure herein *for hearings on applications to appropriate.*

SEC. 9. It is the intention of the Legislature, by the exercise of the police power of the State, to prevent waste of underground water and pollution and contamination of the underground water supply. The State Engineer shall

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[1] *For example, the constitution of New Mexico provides that no act* shall be revised, or amended, *or the provisions thereof extended,* by reference to its title only; whereas the constitution of Utah provides that no law shall be revised or amended by reference to its title only. Certain legislation in 1933 in Utah extended the provisions of existing law to the statute then being passed by referring only to the title of the existing law. This matter will have to be determined for each State in which it is desired to include the last sentence of Section 1.

require the proper capping or valves on all wells that will effectively stop the flow of water when not in use under terms of their permits. He shall also require the proper casing, plugging, or capping, of any well which encounters salt water or water containing mineral or other substances injurious to agriculture or such that the commingling of such water with other waters would render the combined waters unsuitable for domestic or agricultural uses. He shall take necessary measures to prevent the loss of underground water *above* or *below the ground surface* through leaky pipes or other conduits.

SEC. 10. The State Engineer shall prescribe fees for all services provided herein, which shall cover the reasonable cost of State services not defrayed by appropriation or otherwise.

SEC. 11. Any persons or corporations violating any of the provisions of this chapter shall be guilty of a misdemeanor and upon conviction thereof shall be fined not less than ten dollars nor more than one hundred dollars for each offense.

Appendix 16

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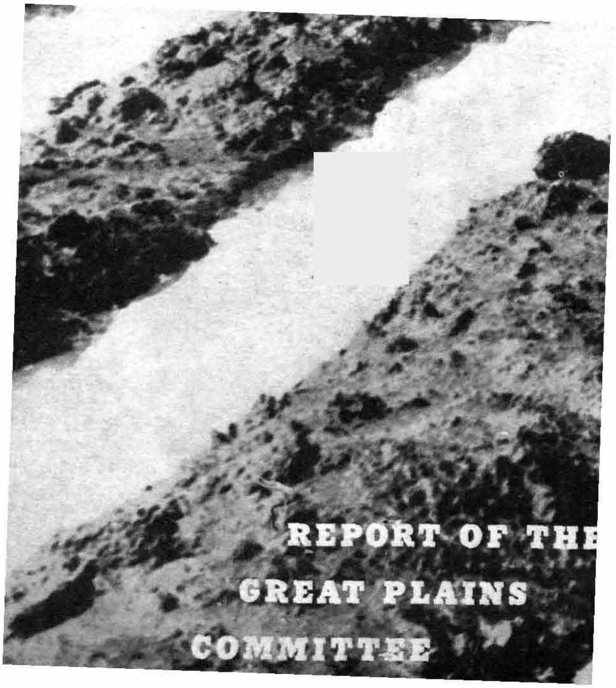
REPORT OF THE
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